



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

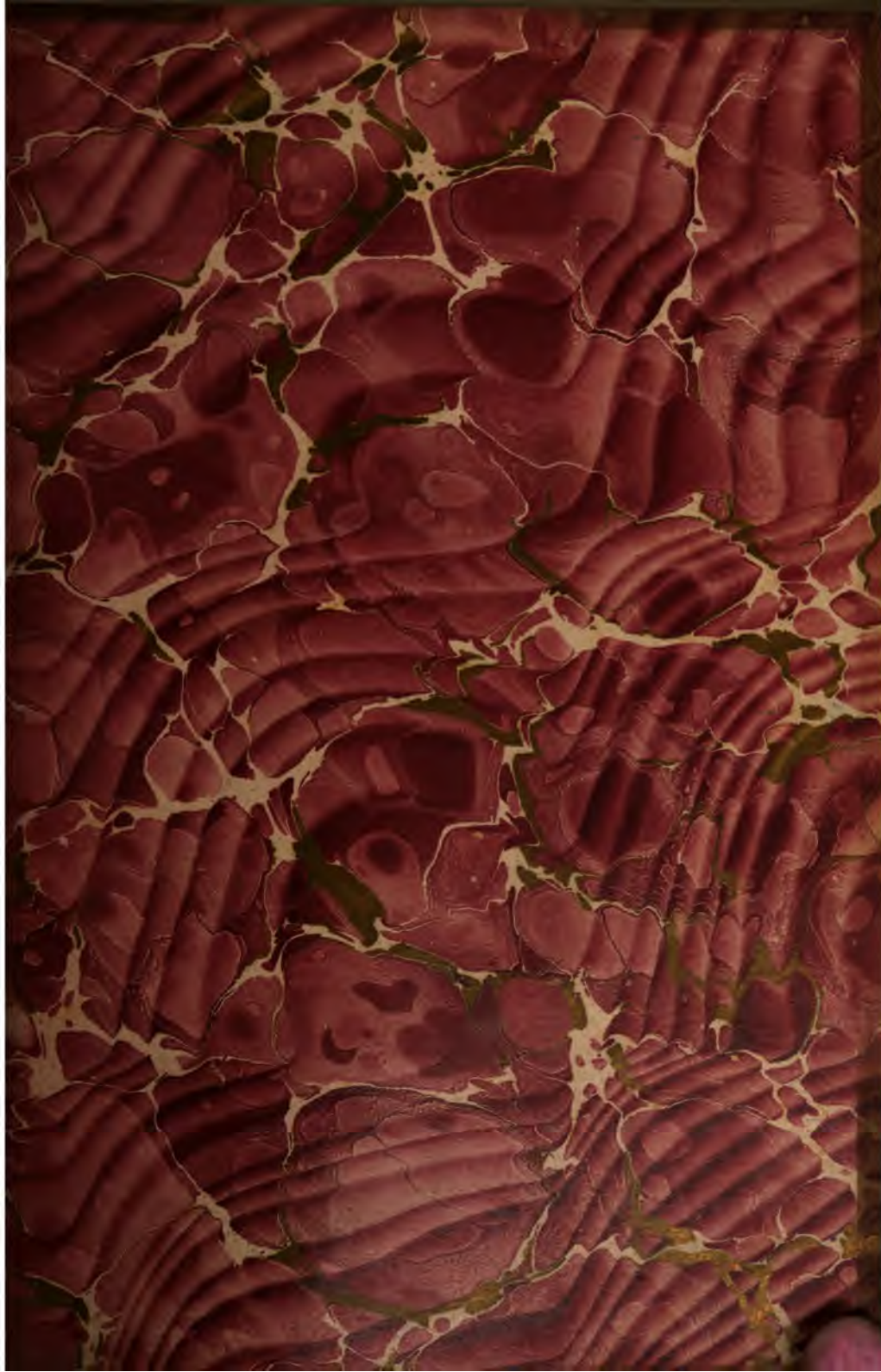
- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>



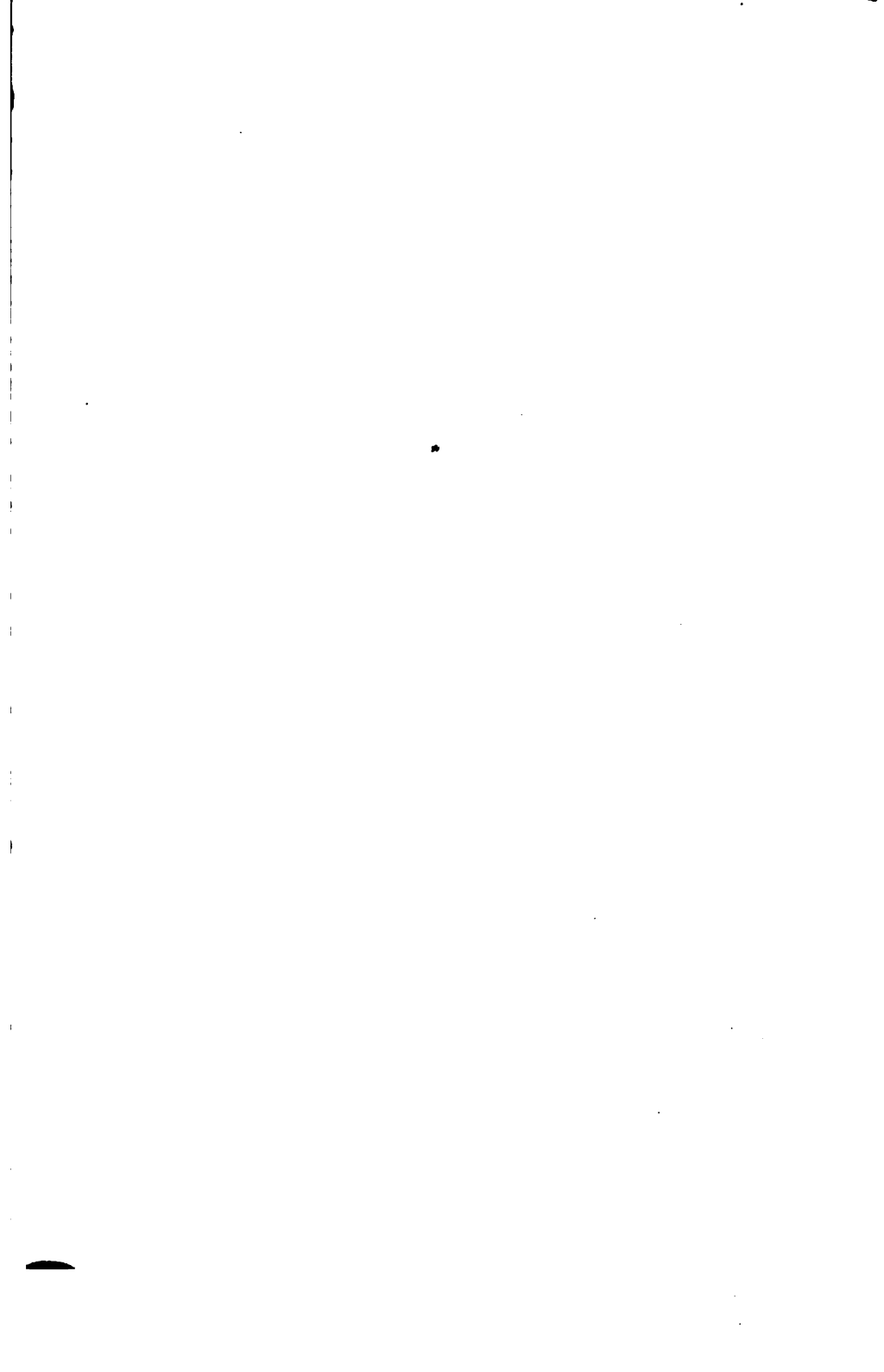
SILAS WRIGHT DUNNING
BEQUEST
UNIVERSITY OF MICHIGAN
GENERAL LIBRARY



94

371

B78



THE
RAY SOCIETY.

Publication, v. 57,

INSTITUTED MDCCCXLIV.



*This volume is issued to the Subscribers to the RAY SOCIETY for
the Year 1879.*

LONDON:

MDCCCLXXXII.



A MONOGRAPH
OF THE
BRITISH SPONGIADÆ.

James
S. Scott
BY THE LATE
J. S. BOWERBANK, LL.D., F.R.S., &c.

EDITED, WITH ADDITIONS, BY THE
REV. A. M. NORMAN, M.A., F.L.S., &c.

VOL. IV
(SUPPLEMENTARY).

LONDON:
PRINTED FOR THE RAY SOCIETY.

MDCCCLXXXII.

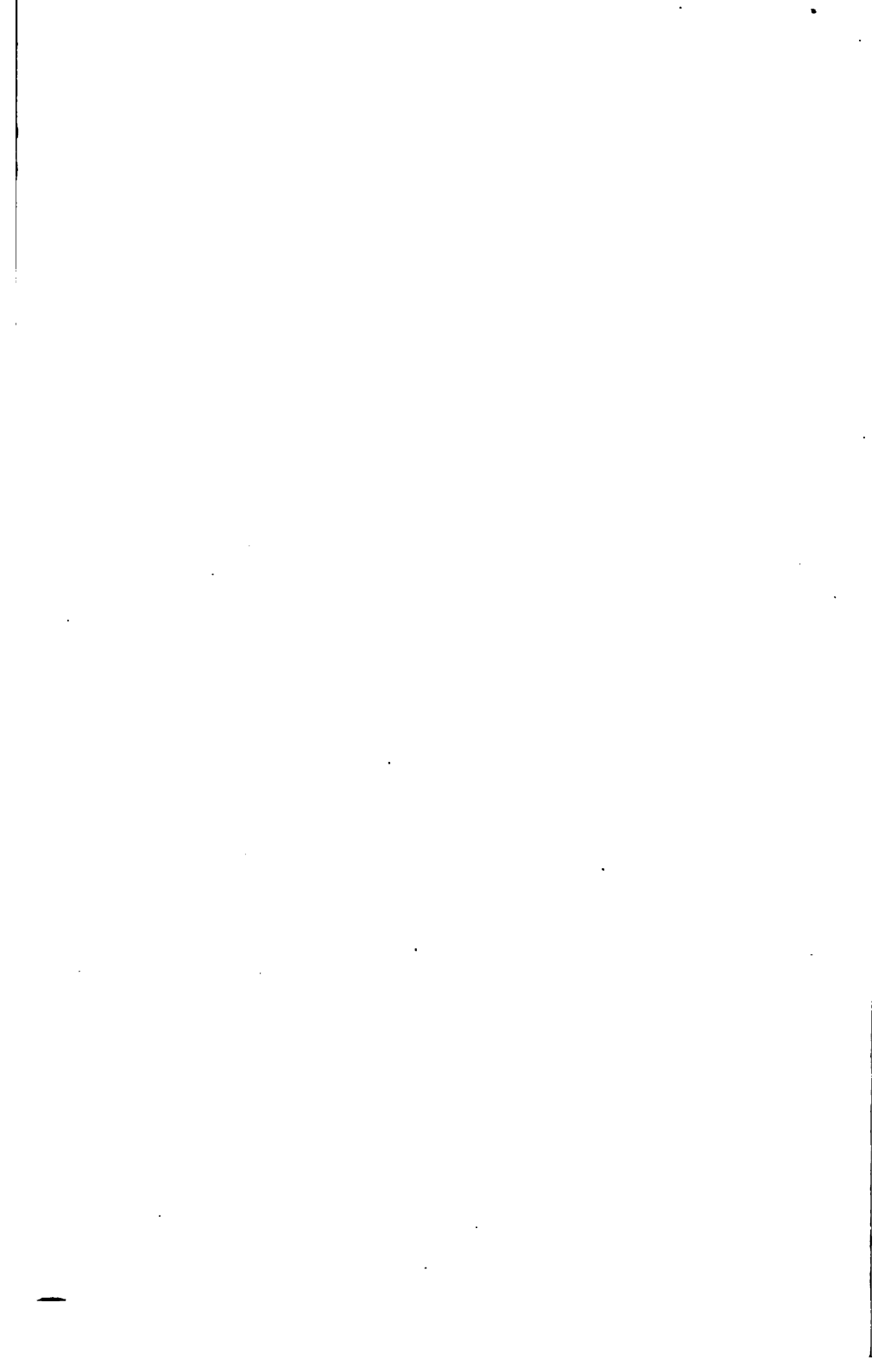


Dunning
 Thorp
 4-2-36
 21524

CONTENTS.

	PAGE
PREFACE	vii
MEMOIR OF DR. BOWERBANK, BY C. TYLER, F.L.S.	xiii
INTRODUCTION	1
CLASSIFIED LIST OF BRITISH SPONGES	5
GEOGRAPHICAL DISTRIBUTION OF BRITISH SPONGES	15
BRITISH SPONGIADÆ, ORDER CALCAREA	25
" " " SILICEA	27
" " " KERATOSA	183
CATALOGUE OF WORKS AND PAPERS ON SPONGES	191
APPENDIX OF BRITISH SPONGES NOT REFERRED TO BY DR. BOWERBANK	225
" A.—CALCAREOUS SPONGES OF ERNST HÆCKEL	225
" B.—THE GENUS CLIONA—SPECIES OF HANCOCK	233
" C.—VARIOUS BRITISH SPONGES	238
INDEX	243

21711.95-51-43



PREFACE.

THE following pages contain an amended list of the British Spongiadæ, with notes on some of the species previously described, and descriptions of many new forms.

The arrangement and nomenclature of Dr. Bowerbank has been of course strictly adhered to throughout.

The descriptions of new species, and *all such other passages as will be found within inverted commas*, are the work of the author, and were either already actually in type, or were found among his manuscripts at the time of his decease.

For the rest the editor is responsible.

His aim has been, *first*, to give a complete list of the species described in the four volumes, with complete references to all that is to be found respecting them, that it may form a key to the whole. *Secondly*, to supply *recent* synonyms; but hardly any references to works published antecedently to the first volume of this work have been recorded. *Thirdly*, to give additional habitats. *Fourthly*, to add notes on certain

of the species where it seemed especially desirable that this should be done. *Fifthly*, to supply a table of Geographical Distribution. *Sixthly*, to furnish a Catalogue of all works and papers published on the Sponges, so far as known to him; and, *Lastly*, to add a brief Appendix which should make known to Spongologists those British Sponges which have been described, but to which no reference was made in the writings of Dr. Bowerbank.

Dr. Bowerbank marked out a certain course for himself, namely, to work out conscientiously and fully the organization and intimate structure of the sponges, and upon the observations thus made to establish a system of classification. He was a pioneer who struck out a new line; others following in his footsteps profited by his work; and while they agreed with him in regarding minute microscopic structure as the basis of classification, looked for generic characters rather in the shapes assumed by the various spicula than, as Bowerbank had done, in the mode of arrangement of those spicula and manner in which they form the skeleton. This must of course be regarded merely as a very broad statement of the essential difference of views. Our author, as he had begun alone, so went on alone in his own way, not so much disregarding as seldom or rarely noticing the views of others. It is for this reason that hardly any synonymy will be found in the previous volumes of this work. To such a great extent did the author disregard references that any reader taking up his volumes would imagine that many of Dr. Bowerbank's own species dated from

the issue of the volume in which he found them, whereas they had really been published elsewhere many years previously. The references now given will supply this omission, and what has been said will enable naturalists to understand the principles on which the author laboured.

The editor has not given any synonymy or references regarding the Calcareous Sponges in the body of the work; to have done this would have necessitated a complete revision of the species, and he refers the student to the Appendix, where will be found a summary of the views of Haeckel.

With respect to the habitats to which the editor's own initial (N.) is attached, indicating thereby that the specimens referred to have either been collected by himself or are in his cabinet, he has thought it advisable only to record the localities of such specimens as have *actually passed through Dr. Bowerbank's hands and been identified by him*. It must be understood, however, that this remark only applies to those habitats which have the initial N. after them; not necessarily to such as are recorded on the authority of other naturalists, unless either the record is in inverted commas without any name after it, thus showing that the note is Dr. Bowerbank's, or it is expressly stated that he had determined the specimens.

A large number of the localities to which the editor's initial is attached will be found to be situated in the counties of Galway and Mayo, where a remarkably fine collection of sponges was obtained during a scientific expedition which Mr. D. Robertson, of Glas-

gow, and himself made to that part of Ireland in the summer of 1874.

In concluding this brief preface, the Editor feels it necessary to state that, while he most gladly gave Dr. Bowerbank all the aid in his power during the progress of his work, and placed his collection unreservedly in his hands for description, he found himself frequently obliged to dissent from the conclusions arrived at by the author. In editing this posthumous volume of his valued friend his aim has been simply to leave it as Dr. Bowerbank's work. To have attempted to indicate his own views would have been to remodel the whole, and the species would have had to be thrown into more numerous genera, defined on different principles, while, on the other hand, the number of so-called species would have been considerably reduced. Great care will, however, require to be used by the naturalist who shall hereafter attempt to rearrange and redefine the species of British Sponges. In every case the *type specimen* should be examined, for to his certain knowledge subsequently found specimens, during the latter years of Dr. Bowerbank's life when his powers of observation were not so keen as they had been, were frequently erroneously referred to already named types with which they had no connection. Let the reviser therefore be cautious and bear in mind that hastily formed conclusions and lumping of species which are really distinct is a greater fault than for a time, if need be, keeping two forms apart which are in reality referable to the same type.

It may be useful to Spongologists to know that Dr.

Bowerbank's collection is now preserved in the British Museum, having been purchased by the nation; and that the late Mr. Albany Hancock's *Olionæ*, described in the Appendix, together with his mountings of the spicula, are in the Museum of Newcastle-upon-Tyne, while a second series of his typical mounted spicula is in the collection of the Editor.

The members of the Ray Society will greatly appreciate the brief notice of the life of Dr. Bowerbank which follows this, and which has been kindly prepared by one who was in close association with him for many years. Few naturalists of the present generation will be aware until they have read that interesting memoir how much the progress of natural history in Great Britain in years gone by was fostered and furthered by the energy, zeal, and enthusiasm of our late kind friend, the author of these volumes.



MEMOIR OF DR. BOWERBANK.

JAMES SCOTT BOWERBANK, LL.D., F.R.S., was born in Sun Street, Bishopsgate, London, on the 14th July, 1797, and received his early education from the then celebrated Dr. Kelly, of Finsbury Square, London.

About the age of fifteen he entered his father's distillery, where in subsequent years, and in conjunction with his late brother Edward, the business was carried on under the name of Bowerbank and Sons.

His strong leaning to scientific investigation began to exhibit itself when he was a mere boy, and at an early age he took up the study of Astronomy, Chemistry, Botany, Geology, Anatomy and Physiology. The pursuit of science, indeed, occupied every moment of his time not necessarily devoted to business, and though he never neglected the latter, he ever made business relations available whenever possible for the furtherance of his researches.

About the year 1820 he joined *The Old Mathematical Society*, which held its meetings in Crispin Street, Spitalfields, and here he attended the well-arranged lectures of Mr. Wilson, a gentleman of considerable acquirements. In this Society Bowerbank was afterwards also appreciated himself as a lecturer on various

subjects; his diagrams and botanical models designed at this period have been used for some years at one of the Metropolitan Hospitals in the class lectures.

He threw himself, with great energy, into the work of the *London Clay Club* and investigated the fossil fruits and seeds from the Isle of Sheppey. In 1840 he began their history, but this publication was not continued; one hundred and eighty thousand fossil fruits and seeds are now in the British Museum as a result of his industry in collecting. Through the efforts of the earnest workers of the *London Clay Club* arose, in 1847, the *Palæontographical Society*, which has done so much to make known the richness of the fossils of our own country, and which has produced up to June, 1882, thirty-six quarto volumes. At the first establishment of the *Palæontographical Society* Dr. Bowerbank was its Honorary Secretary. He held that office a considerable time, and for the last ten years of his life was its President.

Entomology was another of his favourite studies in early days. He wrote a valuable paper in the 'Entomological Magazine,' vol. i, p. 239, 1833, on the "Circulation of the Blood in Insects;" a second, 'Ent. Mag.,' vol. iv, p. 179, 1837, on the "Distribution of the Tracheæ in the Wing of *Chrysopa Perla*;" and a third, 'Ent. Mag.,' vol. v, p. 300, 1838, on the "Structure of the Scales on the Wings of Lepidopterous Insects."

Dr. Bowerbank was one of the originators of the *Royal Microscopical Society*, and filled the office of President. He also frequently contributed to its Transactions.

In the 'Monthly Microscopical Journal,' vol. iii, p. 281, 1870, will be found his account of the early improvements made in the microscope in 1828 by Tully,

and afterwards by Ross, Powell and Leland, and Smith and Beck.

The microscope was his especial delight and study, and by its use his investigations into the structure and habit of Sponges, both recent and fossil, were greatly facilitated and brought to a state of comparative completeness.

His microscope being of very excellent construction so many eminent men came to him in order to examine *their* specimens by *his* Instrument, that he was compelled to fix one night in the week for their reception; and thus originated the celebrated *Monday Evening Meetings*. On those occasions both old friends and students always received a kindly greeting and welcome both at his house in the New North Road, and at his after residence, Park Street, Islington, and finally in his capacious Museum at Highbury Grove.

In 1832 he was elected a Fellow of the *Geological Society*, and soon afterwards wrote a paper for that Society entitled "An Account of a Deposit containing Land Shells at Gore Cliff, Isle of Wight" ('*Geol. Soc. Proc.*,' ii, p. 449, 1837); this memoir was followed by others on the "London and Plastic Clay Formations" ('*Trans. Geol. Soc.*,' vol. vi, p. 168, 1842); on the "Siliceous Bodies of the Chalk, Greensands and Oolites" ('*Trans. Geol. Soc.*,' vol. vi, p. 181, 1842), and on "A New Species of Pterodactyl found in the Upper Chalk of Kent" ('*Geol. Soc. Journ.*,' ii, p. 7, 1845).

He gradually amassed a large collection of fossils very many of which now enrich the national and other collections.

Dr. Bowerbank was one of the founders of the

Zoological Society, and for many years a member of its Council.

It was in his Museum at Highbury Grove that the first idea of an *Aquarium* was started. A small glass jar was used to keep *Ohara translucens* for microscopical purposes, to which was afterwards added some fish and animalcules, until at length the idea was worked out by Mr. N. Ward, Mr. Warrington, Mr. M. Marshall, and others, and brought to its present state of development.

As a Fellow of the *Royal Society* he, in 1857, contributed papers on the Anatomy and Physiology of the Spongiadæ, but it is as a member of the *Ray Society*, which with the late Dr. Johnstone he assisted in founding, and of which he was for many years Treasurer, he will be best known and remembered for his '*Monograph of the British Spongiadæ*.'

In the year 1841 a circumstance occurred which gave a bias to his future studies in favour of the Sponges.

A storm at Brighton had thrown upon the beach vast quantities of seaweed and Sponges as far as the eye could reach. Although dead they were still filled with the soft matter of the Sponge. He selected the most promising specimens, placing them in glass jars filled up with strong spirit, and had them immediately conveyed to London for systematic examination, and from these he derived more information than from many times their number of dry specimens. From this time he devoted himself, with great zeal, to the study of the Spongiadæ, and having agents on many parts of the coast collecting fossils, he employed them in procuring Sponges. Friends also in different parts of the world made consignments which were of the utmost value to him in his investigations. His

general instructions were "Only remove as much of the watery matter as will prevent the Sponges from rotting on the voyage; but do not send me clean specimens as if intended for the bath."

The accumulations of years of collecting, numbering many hundreds of specimens, are now preserved in the British Museum. Forty-five memoirs from his pen, of which the majority refer to Sponges, are recorded in the "Catalogue of Scientific Papers," compiled by the Royal Society.

Dr. Bowerbank, whilst working to complete his fourth volume on the Sponges, was seized with a sudden illness, which within a month terminated fatally. He died at St. Leonards on the 8th March, 1877, in the eightieth year of his age, and lies buried in the Churchyard of Hollington, not far from Hastings, in Sussex.

INTRODUCTION.

“THE third volume of this work was scarcely finished when the Rev. A. M. Norman, who had already rendered me such important service by placing his very fine collection of Sponges in my hands for examination and description, sent me a large quantity of additional specimens which he had recently acquired during his dredging excursions, and in other ways. It is on this collection that the present supplemental volume is chiefly based, but I am also indebted for other new species to my old friend Mr. Peach, and to Mr. Hillier of Ramsgate.

“The greater part of the Sponges sent to me by Mr. Norman were from the North-West of Ireland, and these were found to be especially rich in representatives of the genus *Isodictya*. The very numerous species of this genus already published rendered the labour and care necessary for the examination and comparison of the newly acquired species so great, that I soon felt the necessity of devising a series of divisions and subdivisions of the known forms to facilitate the examination of those which I had now to determine. These divisions and subdivisions proved so very useful, and the discrimination of the species was found to be so

greatly facilitated by their use, that I have been naturally led to the conclusion that they would, if published, be of similar assistance to my brother naturalists who may take up the study of these interesting animals; and as other genera, such as *Hymeniacidon* and *Halichondria*, also contain a very considerable number of species, I have applied to them the same system of division and subdivision.

“In the preface to Vol. II (p. viii), I had already dilated on the necessity of the subdivision of the species of each genus in accordance with the forms and other peculiarities of the skeleton spicula so as to facilitate the recognition of the species; and as our knowledge of the British Sponges has advanced and the number of known species greatly increased since 1866, it has now become necessary, as I have just stated, to still further subdivide the species in those genera in which they have become inconveniently numerous. I have, therefore, in the tabulated list of Sponges which follows these introductory remarks adopted a mode of subsections in many genera by the use of the characters afforded by the dermal membrane in conjunction with those of the skeleton.

“The accurate discrimination of the numerous and protean animals which constitute the class of the Spongiadæ is still a growing science, and as we advance in our experience of the variable characters, from diversities of habitat and other causes, not only of the different genera and species, but also of the individuals of the same species, we find that their correct determination necessitates a more and more minute investigation into the peculiarities of their anatomical structures. The genus in some few cases may be

ascertained with tolerable certainty by a cursory examination of the specimen, but the determination of the species can rarely or never be depended upon without a searching anatomical investigation of the structures, nor can this be achieved by the use of low powers of the microscope, because in very many cases the most characteristic elements of discrimination are exceedingly minute, and often also very few in number; and no definite conclusions can be reached until we have made ourselves intimately acquainted with the whole of the component parts of the subject under examination. Tedious as this mode of thorough investigation may at first sight appear, the admirable adaptation of each part to its own special purpose, and the beautiful forms and arrangement of the spicules and other component elements in the several parts of the Sponge, amply repay the time and care necessary for their investigation and realisation.

“The striking diversity of form which we observe in a great number of the British Sponges is due both to difference in habitat and varieties of basal attachment. The young Sponge, which may have been developed on a slender seaweed or zoophyte, becomes coating and parasitical, but when growing on a shell or stone it assumes either a massive or a coating form. The occurrence of these differences in habitat and localisation render it necessary that they should be observed and recorded. In other branches of marine zoology we have been so accustomed to place dependence on form and colour as important characters, which in Sponges are comparatively of very little value, that these cautions become necessary, and more especially so as the figures in Vol. III are in many instances

taken from small, very rare, or unique specimens, while others subsequently obtained have been found to be of much larger dimensions and to vary to a great extent from the types of the species figured. The structural and anatomical details are in truth the only safe guides to the correct discrimination of species. In a branch of natural history so comparatively new, and which has been so imperfectly studied by our predecessors, it naturally occurs that many of the species have been determined from very imperfect examples, and it therefore is highly desirable to obtain as much additional information as possible with respect to their variations in form, colour, and other characters, and to register as many additional habitats as are obtainable.

“It is, moreover, strikingly apparent from the many new species continually being found among the Sponges dredged and otherwise collected by British naturalists, that those already described do not by any means comprise the whole of our British Fauna, and it is highly probable that future labourers in this interesting field of natural history will add very considerably to their number.”

"CLASSIFIED LIST OF BRITISH SPONGES.

"ORDER 1.—CALCAREA.

Genus I.—GRANTIA.

- | | | |
|------------------------------|--|----------------------------|
| 1. <i>Grantia compressa.</i> | | 3. <i>Grantia ensata.</i> |
| 2. " <i>ciliata.</i> | | 4. " <i>tessellata.</i> |

Genus II.—LEUCOSOLENIA.

- | | | |
|------------------------------------|--|----------------------------------|
| 1. <i>Leucosolenia botryoides.</i> | | 3. <i>Leucosolenia lacunosa.</i> |
| 2. " <i>contorta.</i> | | 4. " <i>coriacea.</i> |

Genus III.—LEUCONIA.

- | | | |
|---------------------------|--|----------------------------|
| 1. <i>Leuconia nivea.</i> | | 3. <i>Leuconia pumila.</i> |
| 2. " <i>fistulosa.</i> | | 4. " <i>Somesii.</i> |

Genus IV.—LEUCOGYPSIA.

Leucogypsia Gossei.

ORDER 2.—SILICEA.

Genus V.—GEODIA.

Geodia Zetlandica.

Genus VI.—PACHYMATISMA.

Pachymatisma Johnstonia.

Genus VII.—NORMANIA

Normania crassa.

Genus VIII.—ECIONEMIA.

- | | | |
|--------------------------------|--|-------------------------------|
| 1. <i>Ecionemia compressa.</i> | | 3. <i>Ecionemia coactura.</i> |
| 2. „ <i>ponderosa.</i> | | |

*Genus IX.—POLYMASTIA.**Section *.—Skeleton spicula acuate.*

- | | | |
|------------------------------|--|------------------------------|
| 1. <i>Polymastia ornata.</i> | | 4. <i>Polymastia brevis.</i> |
| 2. „ <i>bulbosa.</i> | | 5. „ <i>spinula.</i> |
| 3. „ <i>robusta.</i> | | 6. „ <i>radiosa.</i> |

*Section **.—Skeleton spicula spinulate.*

- | | | |
|-----------------------------------|--|--------------------------------|
| 7. <i>Polymastia mammillaris.</i> | | 8. <i>Polymastia conigera.</i> |
|-----------------------------------|--|--------------------------------|

Genus X.—HALYPHYSEMA.

- | | | |
|-------------------------------------|--|---------------------------------|
| 1. <i>Halyphysema Tumanowiczii.</i> | | 2. <i>Halyphysema ramulosa.</i> |
|-------------------------------------|--|---------------------------------|

Genus XI.—CIOCALYPTA.

- | | | |
|----------------------------------|--|----------------------------|
| 1. <i>Ciocalypta penicillus.</i> | | 2. <i>Ciocalypta Leei.</i> |
|----------------------------------|--|----------------------------|

*Genus XII.—TETHYA.**Section *.—Skeleton spicula acerate.*

- | | | |
|-----------------------------|--|-----------------------------|
| 1. <i>Tethya cranium.</i> | | 3. <i>Tethya Schmidtii.</i> |
| 2. „ <i>Collingsii.</i> | | |

*Section **.—Skeleton spicula acuate.*

- | | | |
|-----------------------------|--|---------------------------|
| 4. <i>Tethya lyncurium.</i> | | 5. <i>Tethya spinosa.</i> |
|-----------------------------|--|---------------------------|

*Section ***.—Skeleton spicula spinulate.*

- | |
|------------------------------|
| 6. <i>Tethya spinularia.</i> |
|------------------------------|

Genus XIII.—HALICNEMIA.

Halicnemia patera.

*Genus XIV.—DICTYOCYLINDRUS.**Section *.—Skeleton spicula acerate and acuate.*

- | | | |
|--|--|-------------------------------------|
| 1. <i>Dictyocylindrus ventilabrum.</i> | | 3. <i>Dictyocylindrus radiosus.</i> |
| 2. „ <i>ramosus.</i> | | |

*Section **.*—Skeleton spicula acuate.

- | | | |
|-----------------------------------|--|---|
| 4. <i>Dictyocylindrus</i> Howsei. | | 7. <i>Dictyocylindrus</i> fascicularis. |
| 5. " hispidus. | | 8. " virgultosus. |
| 6. " aculeatus. | | |

*Section ***.*—Skeleton spicula spinulate.

9. *Dictyocylindrus* pumilus.

*Section ****.*—Skeleton spicula cylindrical.

10. *Dictyocylindrus* stuposus. | 11. *Dictyocylindrus* rugosus.

*Section *****.*—Skeleton spicula acuate, and acerate or cylindrical.

12. *Dictyocylindrus* rectangulus.

Genus XV.—*PHAKELLIA*.

1. *Phakellia* robusta. | 2. *Phakellia* ventilabrum.

Genus XVI.—*MICROCIONA*.*Section **.*—Skeleton spicula acerate.

- | | | |
|--------------------------------|--|---------------------------------|
| 1. <i>Microciona</i> fictitia. | | 3. <i>Microciona</i> fraudator. |
| 2. " Kentii. | | 4. " tumulosa. |

*Section *.*—Skeleton spicula acuate.*Sub-section A.*—Skeleton spicula smooth.

5. *Microciona* lævis. | 6. *Microciona* simplicissima.

Sub-section B.—Skeleton spicula spinous.

- | | | |
|------------------------------|--|--------------------------------|
| 7. <i>Microciona</i> fallax. | | 10. <i>Microciona</i> ambigua. |
| 8. " spinulenta. | | 11. " jecusculum. |
| 9. " armata. | | 12. " plumosa. |

*Section ***.*—Skeleton spicula spinulate.

13. *Microciona* atrasanguinea.

Genus XVII.—*HYMERAPHIA*.*Section *.*—Skeleton spicula acuate.

1. *Hymeraphia* vermiculata. | 2. *Hymeraphia* clavata.

*Section **.*—Skeleton spicula spinulate.

- | | | |
|-------------------------------------|--|--------------------------------|
| 3. <i>Hymenaphia verticillata</i> . | | 5. <i>Hymenaphia simplex</i> . |
| 4. " <i>stellifera</i> . | | 6. " <i>coronula</i> . |

Genus XVIII.—HYMEDESMIA.*Section *.*—Skeleton spicula acerate.

- | | | |
|--------------------------------|--|--------------------------------|
| 1. <i>Hymedesmia inflata</i> . | | 2. <i>Hymedesmia occulta</i> . |
|--------------------------------|--|--------------------------------|

*Section **.*—Skeleton spicula acuate.

- | | | |
|--------------------------------|--|-------------------------------|
| 3. <i>Hymedesmia radiata</i> . | | 6. <i>Hymedesmia pilata</i> . |
| 4. " <i>indistincta</i> . | | 7. " <i>pulchella</i> . |
| 5. " <i>pansa</i> . | | 8. " <i>Peachii</i> . |

*Section ***.*—Skeleton spicula spinulate.

- | | | |
|----------------------------------|--|-----------------------------------|
| 9. <i>Hymedesmia stellata</i> . | | 11. <i>Hymedesmia tenuicula</i> . |
| 10. " <i>simplicissima</i> . | | |

*Section ****.*—Skeleton spicula cylindrical.

12. *Hymedesmia Zetlandica*.

Genus XIX.—HYMENIACIDON.*Section *.*—Skeleton spicula acerate.*Sub-section A.*—Dermis aspiculous.

1. *Hymeniacidon albescens*.

Sub-section B.—Dermal spicula dispersed.

- | | | |
|-----------------------------------|--|-----------------------------------|
| 2. <i>Hymeniacidon Thomasii</i> . | | 6. <i>Hymeniacidon membrana</i> . |
| 3. " <i>coccineus</i> . | | 7. " <i>firmus</i> (felted). |
| 4. " <i>lacteus</i> . | | 8. " <i>placentula</i> . |
| 5. " <i>perarmatus</i> . | | 9. " <i>armiger</i> . |

Sub-section C.—Dermal spicula reticulated.

- | | | |
|--|--|---------------------------------------|
| 10. <i>Hymeniacidon Brettii</i> (fasci-
culated). | | 13. <i>Hymeniacidon fallaciosus</i> . |
| 11. " <i>fragilis</i> . | | 14. " <i>tegeticula</i> . |
| 12. " <i>reticulatus</i> . | | 15. " <i>solidus</i> . |

*Section **.*—Skeleton spicula acuate.*Sub-section A.*—Spicula smooth, dermal membrane aspiculous.

- | | |
|----------------------------------|----------------------------------|
| 16. <i>Hymeniacion perlævis.</i> | 18. <i>Hymeniacion crustula.</i> |
| 17. " <i>pachyderma.</i> | 19. " <i>Hillieri.</i> |

Sub-section B.—Spicula of dermis dispersed.

- | | |
|-----------------------------------|-------------------------------------|
| 20. <i>Hymeniacion caruncula.</i> | 26. <i>Hymeniacion virgultosus.</i> |
| 21. " <i>sanguineus.</i> | 27. " <i>radiosus</i> |
| 22. " <i>mammeatus.</i> | <i>(felted).</i> |
| 23. " <i>consimilis.</i> | 28. " <i>medius.</i> |
| 24. " <i>macilentus.</i> | 29. " <i>Aldousii.</i> |
| 25. " <i>fallax.</i> | 30. " <i>virgulatus.</i> |

Sub-section C.—Dermal spicula reticulated or fasciculated.

- | | |
|---------------------------------|-----------------------------------|
| 31. <i>Hymeniacion varians.</i> | 34. <i>Hymeniacion armaturus.</i> |
| 32. " <i>viridans.</i> | 35. " <i>callosus.</i> |
| 33. " <i>aureus.</i> | 36. " <i>plumiger.</i> |

*Section ***.*—Skeleton spicula spinulate.*Sub-section A.*—Dermal membrane aspiculous.

- | | |
|----------------------------------|-------------------------------------|
| 37. <i>Hymeniacion subereus.</i> | 39. <i>Hymeniacion gelatinosus.</i> |
| 38. " <i>carnosus.</i> | 40. " <i>foliatus.</i> |

Sub-section B.—Spicula of dermal membrane dispersed.

- | | |
|-------------------------------|----------------------------------|
| 41. <i>Hymeniacion ficus.</i> | 44. <i>Hymeniacion claviger.</i> |
| 42. " <i>sulphureus.</i> | 45. " <i>tenebrosus.</i> |
| 43. " <i>celatus.</i> | |

Sub-section C.—Spicula of dermal membrane reticulated or fasciculated.

- | | |
|-------------------------------------|-----------------------------------|
| 46. <i>Hymeniacion subclavatus.</i> | 47. <i>Hymeniacion paupertas.</i> |
|-------------------------------------|-----------------------------------|

*Section ****.*—Skeleton spicula cylindrical.

48. *Hymeniacion Dujardinii.*

Genus XX.—BATTERSBYIA.

Battersbyia Bucklandi.

*Genus XXI.—HALICHONDRIA.**Section *.—Skeleton spicula acerate.**Sub-section A.—Dermal membrane aspiculous.*

- | | | |
|-------------------------------------|--|-----------------------------------|
| 1. <i>Halichondria MacIntoshii.</i> | | 2. <i>Halichondria regularis.</i> |
|-------------------------------------|--|-----------------------------------|

Sub-section B.—Spicula of dermal membrane dispersed.

- | | | |
|--------------------------------|--|---------------------------------|
| 3. <i>Halichondria caduca.</i> | | 6. <i>Halichondria coalita.</i> |
| 4. " <i>inconspicua.</i> | | 7. " <i>mutula.</i> |
| 5. " <i>incerta.</i> | | 8. " <i>cylindracea.</i> |

Sub-section C.—Spicula of dermal membrane reticulated.

- | | | |
|--|--|---|
| 9. <i>Halichondria panicea.</i> | | 15. <i>Halichondria Couchii</i> (uni-
<i>spiculous).</i> |
| 10. " <i>glabra.</i> | | 16. " <i>Robertsoni.</i> |
| 11. " <i>angulata.</i> | | <i>(fasciculated).</i> |
| 12. " <i>distorta.</i> | | 17. " <i>condensa</i> (mul-
<i>tispiculous).</i> |
| 13. " <i>edusa.</i> | | 18. " <i>coralloides.</i> |
| 14. " <i>ambigua</i> (mul-
<i>tispiculous).</i> | | |

*Section **.—Skeleton spicula acuate.**Sub-section A.—Skeleton spicula smooth. Dermal spicula dispersed.*

- | | | |
|------------------------------------|--|----------------------------------|
| 19. <i>Halichondria Thompsoni.</i> | | 22. <i>Halichondria subdola.</i> |
| 20. " <i>forceps.</i> | | 23. " <i>foliata.</i> |
| 21. " <i>simplex.</i> | | |

Sub-section B.—Skeleton spicula smooth. Dermis reticulated.

- | | | |
|------------------------------------|--|---------------------------------------|
| 24. <i>Halichondria corrugata.</i> | | 26. <i>Halichondria flabellifera.</i> |
| 25. " <i>falcula.</i> | | |

*Section ***.—Skeleton spicula spinous-acuate. Dermal spicula more or less fasciculated.**Sub-section A.—Spicula of dermal membrane fasciculated.*

- | | | |
|-------------------------------------|--|-----------------------------------|
| 27. <i>Halichondria incrustans.</i> | | 34. <i>Halichondria scandens.</i> |
| 28. " <i>candida.</i> | | 35. " <i>Batei.</i> |
| 29. " <i>irregularis.</i> | | 36. " <i>nigricans.</i> |
| 30. " <i>Dickiei.</i> | | 37. " <i>albula.</i> |
| 31. " <i>Pattersoni.</i> | | 38. " <i>expansa.</i> |
| 32. " <i>pulchella.</i> | | 39. " <i>virgea.</i> |
| 33. " <i>Ingalli.</i> | | |

Sub-section B.—Spicula spinous acute. Dermal spicula dispersed.

40. *Halichondria granulata*.

*Section ****.*—Skeleton spicula spinulate.

41. *Halichondria farinaria*. | 42. *Halichondria inornata*.

Genus XXII.—ISODICTYA.

*Section *.*—Skeleton spicula acerate.

Sub-section A.—Dermal membrane aspiculous. Primary skeleton fibres unispiculous.

- | | | |
|-------------------------------|--|----------------------------------|
| 1. <i>Isodictya cinerea</i> . | | 4. <i>Isodictya ramusculus</i> . |
| 2. " permollis. | | 5. " ferula. |
| 3. " mammeata. | | |

Sub-section B.—Dermis aspiculous. Skeleton bi- or trispiculous.

- | | | |
|-----------------------------|--|-------------------------------|
| 6. <i>Isodictya rosea</i> . | | 8. <i>Isodictya obscura</i> . |
| 7. " pygmæa. | | |

Sub-section C.—Dermal membrane aspiculous. Skeleton : primary fibres multispiculous.

- | | | |
|----------------------------------|--|--------------------------------|
| 9. <i>Isodictya indefinita</i> . | | 13. <i>Isodictya luteosa</i> . |
| 10. " indistincta. | | P14. " anomala (dermal |
| 11. " simplex. | | membrane unknown). |
| 12. " pocillum. | | P15. " parasitica (do.). |

Sub-section D.—Dermal membrane spiculo-reticulated. Skeleton : primary fibres unispiculous.

- | | | |
|--------------------------------|--|--------------------------------|
| 16. <i>Isodictya Peachii</i> . | | 18. <i>Isodictya elegans</i> . |
| 17. " varians. | | 19. " fallax. |

Sub-section E.—Dermal membrane spiculo-reticulated. Skeleton primary lines bi- or trispiculous.

- | | | |
|------------------------------------|--|---------------------------------|
| 20. <i>Isodictya MacAndrewii</i> . | | 23. <i>Isodictya perplexa</i> . |
| 21. " fistulosa. | | 24. " densa. |
| 22. " dichotoma. | | 25. " Gregorii. |

Sub-section F.—Dermal membrane spiculo-reticulated. Skeleton : primary lines multispiculous.

- | | | |
|--------------------------------|--|--------------------------------|
| 26. <i>Isodictya pallida</i> . | | 29. <i>Isodictya incerta</i> . |
| 27. " <i>simulans</i> . | | 30. " <i>crassa</i> . |
| 28. " <i>Ingalli</i> . | | |

Sub-section G.—Spicula of dermis dispersed. Skeleton : primary fibres bi- or trispiculous.

- | | | |
|------------------------------------|--|-----------------------------------|
| 31. <i>Isodictya Bowerbanki</i> (= | | 33. <i>Isodictya paupercula</i> . |
| <i>I. simulo</i>). | | 34. " <i>clava</i> . |
| 32. " <i>filamenta</i> . | | |

Sub-section H.—Spicula of dermis dispersed. Skeleton : primary lines multispiculous.

- | | | |
|-------------------------------|--|-------------------------------|
| 35. <i>Isodictya jugosa</i> . | | 37. <i>Isodictya trunca</i> . |
| 36. " <i>palmata</i> . | | |

*Section **.*—Spicula of the skeleton acuate.

Sub-section A.—Dermal membrane aspiculous. Skeleton : primary fibres multispiculous, smooth.

- | | | |
|--|--|---------------------------------|
| 38. <i>Isodictya infundibuliformis</i> . | | 40. <i>Isodictya gracilis</i> . |
| 39. " <i>dissimilis</i> . | | 41. " <i>invalida</i> . |

Sub-section B.—Dermal membrane spicula dispersed. Primary skeleton fibres with few smooth spicula.

42. *Isodictya Normani*.
 43. " *coriacea* (some of the acuates incipiently spinous).
 44. " *hispida*.

Sub-section C.—Dermal membrane spiculous, spicula dispersed. Primary skeleton fibres multispiculous.

- | | | |
|--------------------------------|--|----------------------------------|
| 45. <i>Isodictya fucorum</i> . | | 53. <i>Isodictya laciniosa</i> . |
| 46. " <i>Alderi</i> . | | 54. " <i>dubia</i> . |
| 47. " <i>Edwardii</i> . | | 55. " <i>imitata</i> . |
| 48. " <i>lobata</i> . | | 56. " <i>nodosa</i> . |
| 49. " <i>paupera</i> . | | 57. " <i>involuta</i> . |
| 50. " <i>uniformis</i> . | | 58. " <i>pertenuis</i> . |
| 51. " <i>Clarkei</i> . | | 59. " <i>scitula</i> . |
| 52. " <i>Barleei</i> . | | |

Sub-section D.—Dermal membrane spiculous, spicula reticulated.
Primary skeleton fibres multispiculous.

60. *Isodictya collina*.

*Section ***.*—Spicula of skeleton acuate, more or less spinous.

Sub-section A.—Primary lines of the skeleton bi- or trispiculous.

61. *Isodictya Beanii*.

62. „ *Normani*.

63. „ *coriacea*.

64. *Isodictya funalis*.

65. „ *Hyndmani*.

Sub-section B.—Primary lines of the skeleton multispiculous.

66. *Isodictya lurida*.

67. „ *fimbriata*.

68. „ *tumulosa*.

69. „ *rugosa*.

70. *Isodictya implicita*.

71. „ *inæqualis*.

72. „ *deformis*.

Genus XXIII.—*RAPHIODESMA*.

*Section **.*—Skeleton spicula acuate.

1. *Raphiodesma floreum*.

2. „ *lingua*.

3. „ *simplicissimum*.

4. *Raphiodesma sordidum*.

5. „ *fallaciosum*.

6. „ *intermedium*.

Genus XXIV.—*SPONGILLA*.

*Section *.*—Skeleton spicula acerate. Spicula of ovaria birotulate.

1. *Spongilla fluviatilis*.

2. *Spongilla Parfitti*.

*Section **.*—Skeleton spicula acerate. Ovaria spiculous: spicula not birotulate.

3. *Spongilla lacustris*.

4. *Spongilla sceptrifera*?

Genus XXV.—*DESMACIDON*.

*Section *.*—Skeleton spicula acerate.

1. *Desmacidon fruticosus*.

2. *Desmacidon Jeffreysii*.

*Section **.*—Skeleton spicula acuate.

3. *Desmacidon Peachii*.

4. „ *constrictus*.

5. *Desmacidon incognitus*.

6. „ *pannosus*.

Sub-section A.—Spicula acute subclavate.

- | | | |
|-------------------------|--|------------------------|
| 7. Desmacidon copiosus. | | 9. Desmacidon rotalis. |
| 8. „ cavernula. | | 10. „ similis. |

*Section ***.*—Skeleton spicula spinulate.

11. Desmacidon agagropilus.

*Section ****.*—Skeleton spicula cylindrical.

12. Desmacidon columella.

Genus XXVI.—RAPHYRUS.

Raphyrus Griffithsii.

Genus XXVII.—DIPLODEMIA.

Diplodemia vesicula.

ORDER 3.—KERATOSA.

Genus XXVIII.—SPONGIONELLA.

Spongionella pulchella.

Genus XXIX.—CHALINA.*Section *.*—Skeleton spicula acerate.

- | | | |
|---------------------|--|-------------------------|
| 1. Chalina oculata. | | 5. Chalina gracilentia. |
| 2. „ cervicornis. | | 6. „ limbata. |
| 3. „ Montaguui. | | 7. „ Grantii. |
| 4. „ Flemingii. | | |

*Section **.*—Skeleton spicula acute.

8. Chalina inornata.

Genus XXX.—OPHLITASPONGIA.

1. Ophlitaspongia papilla. | 2. Ophlitaspongia seriata.

Genus XXXI.—VERONGIA.

Verongia Zetlandica.

Genus XXXII.—DYSIDEA.

1. Dysidea fragilis. | 2. Dysidea coriacea."

GEOGRAPHICAL DISTRIBUTION.

THE following table has been prepared in order to show the known geographical and bathymetrical distribution of the British Sponges. With very few exceptions, the localities inserted in the columns are such only as have been recorded in the 'Monograph of the British Spongiadæ.' The columns "Abyssal" and "100—500 fathoms" have been partially filled in from Mr. Carter's Report of the Sponges dredged in the "Porcupine" Expeditions of 1869 and 1870 ('Ann. Nat. Hist.,' ser. 4, vol. xviii, 1876). The table makes it clear that the Sponge Fauna of many parts of our seas remains almost wholly unexplored; and it is hoped that the very deficiency exhibited here will have a tendency among many other causes to induce our younger and rising naturalists to take up the great field of research which here lies open to them. Speaking from a very extended knowledge of the zoology of our coasts, I unhesitatingly state that no other class of animals offers to the student so rich a field for exploration, or one in which he is likely to meet with so many hitherto unknown species.

A. M. N.

	Shetland.	N. Scotland and Orkney.	E. Scotland.	W. Scotland and Hebrides.	Clyde District.	N. Ireland.	W. Ireland.	S. Ireland.	St. George's Channel, &c.	Devon and Cornwall.	S. England.	Channel Islands.	E. England.	Abyssal.	Littoral.	1-50 fathoms.	50-100 fathoms.	100-500 fathoms.
GRANTIA.																		
1. compressa (<i>O. Fab.</i>)....	+	...	+	+	+	+	+	...	+	+	+	+	+	...	+	+		
2. ciliata (<i>O. Fab.</i>)	+	...	+	+	+	...	+	...	+	+	+	+	+	...	+	+		
3. ensata, <i>Bow.</i>	+	+	+	+		
4. tessallata, <i>Bow.</i>	+	+	+		
LEUCOSOLENIA.																		
1. botryoides (<i>Ell. & Sol.</i>)	+	+	...	+	+	+	+	+	+		
2. contorta, <i>Bow.</i>	+	+	p	...	+	+		
3. lacunosa (<i>Johns.</i>)	+	+	+	+	+	...	+	+		
4. coriacea (<i>Flem.</i>)	+	+	...	+	+	+	+	...	+	+		
LEUCONIA.																		
1. nivea (<i>Flem.</i>)	+	+	+	+	+	+	...	+	+		
2. fistulosa (<i>Johns.</i>)	+	+	+	...	+	+	+		
3. pumila, <i>Bow.</i>	+	+		
4. <i>Somesii</i> , <i>Bow.</i>	p	p	...		
LEUCOGYPSIA.																		
1. <i>Gosseii</i> , <i>Bow.</i>	+	+	...	+	+	...		
GEODIA.																		
1. <i>Zetlandica</i> , <i>Johns.</i>	+	p	
PACHYMATISMA.																		
1. <i>Johnstonia</i> , <i>Bow.</i>	+	+	+	...	+	...	+	+	+		
NORMANIA.																		
1. <i>crassa</i> , <i>Bow.</i>	+	+	+	+
ECIONEMIA.																		
1. <i>compressa</i> , <i>Bow.</i>	+	+	
2. <i>ponderosa</i> , <i>Bow.</i>	+	+	+		
3. <i>coactura</i> , <i>Bow.</i>	+	+	+		
POLYMASTIA.																		
1. <i>ornata</i> , <i>Bow.</i>	+	+		
2. <i>bulbosa</i> , <i>Bow.</i>	+	p		
3. <i>robusta</i> , <i>Bow.</i>	+	+	+		
4. <i>brevis</i> , <i>Bow.</i>	+	+	+	...	+	+	+

	Shetland.	N. Scotland and Orkney.	E. Scotland.	W. Scotland and Hebrides.	Clyde District.	N. Ireland.	W. Ireland.	S. Ireland.	St. George's Channel, &c.	Devon and Cornwall.	S. England.	Channel Islands.	E. England.	Abyssal.	Littoral.	1—50 fathoms.	50—100 fathoms.	100—500 fathoms.
POLYMASTIA (continued).																		
5. <i>spinula</i> , Bow.....	+	+	+	+	+	+	..
6. <i>radiosa</i> , Bow.....	+	+	+	+	+	..
7. <i>mammillaris</i> (Johns.)	+	+	..	+	+	..	+	+	..	+	+	+	+	..
8. <i>conigera</i> , Bow.....	+	+	+	..
HALIPHYSEMA.																		
1. <i>Tumanowiczii</i> , Bow...	+	+	+	+	+	+	+	..
2. <i>ramulosa</i> , Bow.....	+	+	+	+	..
OIOCALYPTA.																		
1. <i>penicillus</i> , Bow.....	+	+	+	..
2. <i>Leei</i> , Bow.....	+	+	+	..
TETHYA.																		
1. <i>cranium</i> (Lamk)	+	+	+	+	..	+	+	..
2. <i>Collingsii</i> , Bow.....	+	+	+	+	+	..
3. <i>Schmidtii</i> , Bow.....	+	+	+	..	+
4. <i>lyncurium</i> , (Linn.) ...	+	+	+	+	+	+	..	+	+
5. <i>spinosa</i> , Bow.....	+	p
6. <i>spinularia</i> , Bow.....	+	+	..
HALICNEMIA.																		
1. <i>patera</i> , Bow.....	+	+	+	+	..
DICTYOCYLINDRUS.																		
1. <i>ventilabrum</i> , Bow.....	+	+	..
2. <i>ramosus</i> (Montagu)...	+	+	+	+	+	..
3. <i>radiosus</i> , Bow.....	+	+	+	+	..
4. <i>Howsei</i> , Bow.....	+	+	+	..
5. <i>hispidus</i> (Montagu)...	+	+	+	+	+	+	+	..
6. <i>aculeatus</i> , Bow.....	+	+	+	+	..
7. <i>fascicularis</i> , Bow.....	+	+	+	+	..
8. <i>virgulosus</i> , Bow.....	+	+	+	..
9. <i>pumilus</i> , Bow.....	+	..	+	+	..	+	+	+	..
10. <i>stuposus</i> (Montagu)...	+	+	..	+	..	+	..	+	..	+	+	+	+	..
11. <i>rugosus</i> , Bow.....	+	+	+	+	..
12. <i>rectangulus</i> , Bow.....	+	+	+	..

[illegible]

	Shetland.	N. Scotland and Orkney.	E. Scotland.	W. Scotland and Hebrides.	Clyde District.	N. Ireland.	W. Ireland.	S. Ireland.	St. George's Channel, &c.	Devon and Cornwall.	S. England.	Channel Islands.	E. England.	Abyssal.	Littoral.	1-50 fathoms.	50-100 fathoms.	100-500 fathoms.
HYMENIACIDON.																		
1. albescens (<i>Johns.</i>).....	+	+	+	..	+
2. Thomasii, <i>Bow</i>	+	+	..	+	+	+
3. coccineus, <i>Bow</i>	+	+	+	+	..	+	+
4. lacteus, <i>Bow</i>	+	+	+
5. perarmatus, <i>Bow</i>	+	+	..
6. membrana, <i>Bow</i>	+	+
7. firmus, <i>Bow</i>	+	+	+
8. placentula, <i>Bow</i>	+	+	+	..
9. armiger, <i>Bow</i>	+	+
10. Brettii, <i>Bow</i>	+	+
11. fragilis, <i>Bow</i>	+	+
12. reticulatus, <i>Bow</i>	+	+	+
13. fallaciosus, <i>Bow</i>	+	..	+	+	..	+	+
14. tegeticula, <i>Bow</i>	+	+
15. solidus, <i>Bow</i>	+	+
16. perlævis (<i>Montagu</i>).....	+	+	+
17. pachyderma, <i>Bow</i>	+
18. crustula, <i>Bow</i>	+	+	+	+
19. Hillieri, <i>Bow</i>	+	+
20. caruncula, <i>Bow</i>	+	..	+	+	+	+	+
21. sanguineus (<i>Grant</i>).....	+	+	..	+	+	+	+	+
22. mammeatus, <i>Bow</i>	+	+	..	+	+
23. consimilis, <i>Bow</i>	+	+	+
24. macilentus, <i>Bow</i>	+	+
25. fallax, <i>Bow</i>	+	+
26. virgulosus (<i>Johns.</i>).....	+	..	+	+	+	..
27. radiosus, <i>Bow</i>	+
28. medius, <i>Bow</i>	+	+	+
29. Aldousii, <i>Bow</i>	+
30. virgulatus, <i>Bow</i>	+	+
31. varians, <i>Bow</i>	+	+
32. viridans, <i>Bow</i>	+	+	..	+	+	+
33. aureus (<i>Montagu</i>).....	+	..	+	+	..	+	+	+
34. armaturus, <i>Bow</i>	+	+
35. callosus, <i>Bow</i>	+	+
36. plumiger, <i>Bow</i>	+	+
37. subereus (<i>Montagu</i>).....	+	+	..	+	+	+	..	+	..	+	+
38. carnosus (<i>Johns.</i>).....	+	+	+	..	+	+	+	..	+	..	+	+
39. gelatinosus, <i>Bow</i>	+	..	+

	Shetland.	N. Scotland and Orkney.	E. Scotland.	W. Scotland and Hebrides.	Clyde District.	N. Ireland.	W. Ireland.	S. Ireland.	St. George's Channel, &c.	Devon and Cornwall.	S. England.	Channel Islands.	E. England.	Abyssal.	Littoral.	1-50 fathoms.	50-100 fathoms.	100-500 fathoms.
HALICHONDRIA—																		
(continued).																		
25. <i>falcula</i> , Bow.....	+																	+
26. <i>flabellifera</i> , Bow.	+	+	+	+	+		+		+							+		
27. <i>incrustans</i> (<i>Esper.</i>) ...	+	+	+	+	+					+	+	+				+		
28. <i>candida</i> , Bow.												+				+		
29. <i>irregularis</i> , Bow.											+					+		
30. <i>Dickiei</i> , Bow.....	+		+			+				+						+		
31. <i>Pattersoni</i> , Bow.	+			+		+				+	+					+		
32. <i>pulchella</i> , Bow.....												+						
33. <i>Ingalli</i> , Bow.....			+								+					+		
34. <i>scandens</i> , Bow.....	+																+	
35. <i>Batei</i> , Bow.....	p																	
36. <i>nigricans</i> , Bow.....		p		p					+	+	+					+		
37. <i>albula</i> , Bow.	+																p	
38. <i>expansa</i> , Bow.				+												+		
39. <i>virgea</i> , Bow.													+			+		
40. <i>granulata</i> , Bow.....				+			+						+			p	+	
41. <i>farinaria</i> , Bow.....					+	+	+		+		+					+		
42. <i>inornata</i> , Bow.....	+																p	
ISODICTYA.																		
1. <i>cinerea</i> (<i>Grant</i>).....	+	+	+	+			+			+	+	+	+		+	+		
2. <i>permollis</i> , Bow.....			+						+				+			p		
3. <i>mammeata</i> , Bow.....										+	+					+		
4. <i>ramusculus</i> , Bow.																+		
5. <i>ferula</i> , Bow.							+									+		
6. <i>rosea</i> , Bow.									+				+			+		
7. <i>pygmæa</i> , Bow.													+			+		
8. <i>obscura</i> , Bow.											+	+					+	
9. <i>indefinita</i> , Bow.....										+						+		
10. <i>indistincta</i> , Bow.....		+					+		+	+	+					+		
11. <i>simplex</i> , Bow.							+		+		+	+				+		
12. <i>pocillum</i> , Bow.....											+					+		
13. <i>luteosa</i> , Bow.									+							+		
14. <i>anomala</i> , Bow.....									+									
15. <i>parasitica</i> , Bow.		+														+		
16. <i>Peachii</i> , Bow.....		p					+					+				+		
17. <i>varians</i> , Bow.	+								+								p	
18. <i>elegans</i> , Bow.						+						+			+	+		

	Shetland.	N. Scotland and Orkney.	E. Scotland.	W. Scotland and Hebrides.	Clyde District.	N. Ireland.	W. Ireland.	S. Ireland.	St. George's Channel, &c.	Devon and Cornwall.	S. England.	Channel Islands.	E. England.	Abyssal.	Littoral.	1-50 fathoms.	50-100 fathoms.	100-500 fathoms.
ISODICTYA (continued).																		
57. involuta, Bow.							+									+		
58. pertenuis, Bow.							+								+			
59. scitula, Bow.							+									+		
60. collina, Bow.							+								+			
61. Beanii, Bow.										+					p			
62. funalis, Bow.											+							+
63. Hyndmani, Bow.		+					+		+		+				+		+	+
64. lurida, Bow.													+			+		
65. fimbriata, Bow.	+																+	+
66. tumulosa, Bow.										+								
67. rugosa, Bow.											+					+		
68. implicita, Bow.							+									+		
69. inæqualis, Bow.																		
70. deformis, Bow.		+														+		
RAPHIODESMA.																		
1. florem, Bow.	+			+			+		+						+	+		
2. lingua, Bow.	+						p									p		+
3. simplicissimum, Bow.				+			+									+		
4. sordidum, Bow.											+	+				+		
5. fallaciosum, Bow.							+									+		
6. intermedium, Bow.							+									+		
SPONGILLA.																		
1. fluviatilis (Pallas) ...										+	+		+					
2. Parfitti, Carter.										+								
3. lacustris (Don.)							+				+							
4. sceptrifera, Bow.										+								
DESMACIDON.																		
1. fruticosus (Montagu). +										+	+	+				+		
2. Jeffreysii, Bow.	+																	+
3. Peachii, Bow.	+																p	
4. constrictus, Bow.	+						+									+		
5. incognitus, Bow.										+					p			
6. pannosus, Bow.	+											+				+		

	Shetland.	N. Scotland and Orkney.	E. Scotland.	W. Scotland and Hebrides.	Clyde District.	N. Ireland.	W. Ireland.	S. Ireland.	St. George's Channel, &c.	Devon and Cornwall.	S. England.	Channel Islands.	E. England.	Abyssal.	Littoral.	1—50 fathoms.	50—100 fathoms.	100—500 fathoms.
DESMACIDON (continued).																		
7. copiosus, Bow.							+			+	+				+	+		
8. cavernula, Bow.	+						+								+			
9. rotalis, Bow.									+	+						+		
10. similaris, Bow.							+					+			+	+		
11. ægagrophilus (Scouler) ..							+		+	+	+	+			+	+		
12. columella, Bow.									+						+			
RAPHYRUS.																		
1. Griffithsii, Bow.	+						+		+	+						+		
DIPLODEMIA.																		
1. vesicula, Bow.	+																p	
SPONGIONELLA.																		
1. pulchella (Sowerby) ..	+						+					+				+	+	
CHALINA.																		
1. oculata (Pallas)										+	+	+				+		
2. cervicornis (Pallas) ..			+							+						p		
3. Montagui (Flem.)							+			+	+					+		
4. Flemingii, Bow.										+						p		
5. gracilentia, Bow.				+						+	+		+		+			
6. limbata (Montagu) ...							+			+		+			+			
7. Grantii, Bow.										+			+			p		
8. inornata, Bow.							+		+						+			
OPHLITASPONGIA.																		
1. papilla, Bow.							+				+				+	+		
2. seriata (Grant)			+	+			+		+	+	+				+	+		
VERONGIA.																		
1. Zetlandica, Bow.	+																+	
DYSIDEA.																		
1. fragilis (Montagu) ...	+		+				+		+	+	+		+		+	+		+
2. coriacea, Bow.							+			+						+		
	96	15	27	33	13	10	97	2	45	72	60	91	47	14	80	159	33	23

BRITISH SPONGIADÆ.

Class—PORIFERA.

ORDER I.—CALCAREA, I, 160.

Genus 1.—GRANTIA, *Fleming*, I, 162; II, 1.

1. GRANTIA COMPRESSA (*O. Fab.*), II, 17; I, Pl. XXI, figs. 312—314; III, Pl. I, figs. 1—12.
2. GRANTIA CILIATA (*O. Fab. ?*), II, 19; I, Pl. XXVI, figs. 345, 346a; III, Pl. II, figs. 1—15.
3. GRANTIA ENSATA, *Bow.*, II, 25; III, Pl. II, figs. 16—20.
4. GRANTIA TESSELATA, *Bow.*, II, 26; I, Pl. XVII, fig. 286; III, Pl. II, figs. 21—27.

Genus 2.—LEUCOSOLENIA, *Bow.*, I, 164; II, 2.

1. LEUCOSOLENIA BOTRYOIDES, *Ellis and Sol.*, II, 28; I, Pl. XXVI, figs. 347, 348; III, Pl. III, figs. 1—4.
2. LEUCOSOLENIA CONTORTA, *Bow.*, II, 29; III, Pl. III, figs. 5—10.

3. *LEUCOSOLENIA LACUNOSA* (*Johnston*), II, 32; III, Pl. IV, figs. 1—8.
4. *LEUCOSOLENIA CORIACEA* (*Fleming*), II, 34; III, Pl. III, figs. 11—14.

Genus 3.—*LEUCONIA*, *Grant*, I, 164; II, 2.

1. *LEUCONIA NIVEA* (*Fleming*), II, 36; III, Pl. V, figs. 1—8.
2. *LEUCONIA FISTULOSA* (*Johnston*), II, 39; III, Pl. V, figs. 9—16.
3. *LEUCONIA PUMILA*, *Bow.*, II, 41; III, Pl. VI, figs. 1—5.
4. *LEUCONIA SOMESII*, *Bow.*, III, 334; Pl. XCI, figs. 6—17.

Genus 4.—*LEUCOGYPSIA*, *Bow.*, I, 165; II, 2.

- LEUCOGYPSIA GOSSEI*, *Bow.*, I, 42; Pl. XXVI, figs. 349, 350; III, Pl. VI, figs. 6—8.

ORDER II.—SILICEA, I, 166; II, 3.

SUBORDER I.—I, 166; II, 3.

Genus 5.—GEODIA, *Lamarck*, I, 167; II, 3.

GEODIA ZETLANDICA, *Johnston*, II, 45; III, Pl. VII, figs. 1—10.

1867 *Cydonium Mülleri*, Gray. Proc. Zool. Soc., p. 548.

1870 *Geodia Zetlandica*, Schmidt. Grunzüge einer Spongien des Atlantischen Gebietes, p. 76.

Carter has described three forms of *Geodia* from the "Porcupine" dredgings, but does not record *G. Zetlandica* as having been met with in that expedition. His *Geodia megastrella*, however, appears to come very near to Johnston's species. May it not be the same? The chief difference appears to be that *G. Zetlandica* is described by Bowerbank as having not only fusiformi-acerate skeleton spicula, but also "*fusiformi-acuates*," while the latter do not occur in *G. megastrella*. It is, however, worthy of notice, that although these spicula are described in Vol. II, no figure is given of them in Vol. III; did our author find that he had made a mistake with respect to these spicules? But granted the presence of *fusiformi-acuates* along with the *fusiformi-acerates* of *G. Zetlandica*, and their absence in *G. megastrella*, would this character be necessarily of specific importance in this group of sponge? If the reader will turn a few pages on to the description of

the forms of *Tethya cranium*, he will find a so-called variety of that species named *acufera*, which differs from the typical *cranium* in exactly the same manner as *Geodia Zetlandica* is distinguishable from *G. megastrella*, namely, by an intermixture of fusiformi-acuate with the usual fusiformi-acerate skeleton spicula.

Genus 6.—*PACHYMATISMA*, *Bow.*, I, 171; II, 3.

PACHYMATISMA JOHNSTONIA, *Bow.*, II, 51; I, Pl. I, figs. 15, 17, 20, 21; Pl. II, figs. 45, 46; Pl. IV, fig. 93; Pl. VI, figs. 158, 159; Pl. XXIV, figs. 330—332; Pl. XXVII, fig. 353; III, Pl. VIII, figs. 1—7.

1869 *Pachymatisma Johnstonia*, Carter. *Ann. Nat. Hist.*, ser. 4, vol. iv, p. 8, pl. ii, figs. 7—18.

1873 *Caminus osculatus*, Grube. *Mittheil. ü. St. Malo u. Roscoff, &c.*, p. 132, Taf. ii, figs. 3, 3 a—e.

Procured by me in 1867 in “Will Hellyer,” a cave at the most northern point in the British Islands, the headland on the east side of Burrafirth in the island of Unst, Shetland. This cave, which is always filled by the sea, cannot possibly be entered except in the calmest weather; and the Sponge having been caught sight of at its furthest extremity, was at length procured, though not without incurring some danger. This is the only instance of its occurrence in Shetland (N.). Budleigh-Salterton (Carter).

Genus 7.—*NORMANIA*, *Bow.*, III, 258.

1868 *Normania*, Bowerbank. In *Last Report of Dredging among the Shetland Isles; Norman on the Porifera* (Brit. Assoc. Rep.), 1868, p. 328.

NORMANIA CRASSA, *Bow.*, III, 258; Pl. LXXXI, figs. 1—12.

1868 *Normania crassa*, Bowerbank. Last Report of Dredging among the Shetland Isles; Norman on the Porifera (Brit. Assoc. Rep.), 1868, p. 328.

The type-specimens were dredged in 110 fathoms 20—25 miles N.N.E. of Burrafirth Lighthouse, Shetland; but the small specimens mentioned (III, 262) are erroneously recorded by the author as from Shetland. They were dredged by me in company with Dr. Gwyn Jeffreys in the Minch in 1866.

Mr. Carter ('Ann. Nat. Hist.,' ser. 5, vol. ii, 1878, p. 176) has stated that "the type-specimen of Dr. Bowerbank's *Normania crassa* is only a sessile form of *Tethya muricata*, in every respect similar to one which was dredged up on board H.M.S. 'Porcupine.' *Tethya muricata* is better known as *Wyvillethomsonia Wallichii*, a sponge which will, after bearing many synonyms, probably have to settle down as *Thenaea muricata* (Bow). Mr. Carter speaks very confidently respecting the type of *Normania crassa*, a sponge which is in my cabinet, and which he has never seen, but he has fallen into an extraordinary error. I know not well how two sponges belonging to the same group could well be more distinct than the two, which he would thus synonymise. They not only differ altogether in *all* external characters, but their spicula are wholly different. Without going into further detail it will suffice to state that the most characteristic "attenuato-expando-ternate" bifurcating connecting and defensive spicules of *Thenaea*, figured by Bowerbank ('Proc. Zool. Soc.,' 1872, pl. v, fig. 4) and by Kent ('Month. Micros. Jour.,' vol. iv, 1870, pl. lxvi, figs. 6, 7) the "simple attenuato-

expando-ternates," *Bow.*, fig. 3, *Kent.*, fig. 7a, and the "recurvo-ternates," *Kent.*, figs. 8, 9, are altogether absent in *Normania*, where their place is taken by the "large subfusiformi-acerates" and the "small subfusiformi-acerates," *Bow.*, 'Brit. Spong.,' III, Pl. LXXXI, figs. 4 and 9, and the peculiar "abnormal forms of connecting spicula," figs. 6, 7, 8. Indeed the only point in which the two sponges agree is that both are furnished with "stellates."

Genus 8.—*ECIONEMIA*, *Bow.*, I, 173; II, 4.

ECIONEMIA, *Bow.*, June, 1862 — *STELLETTA*, *Schmidt*, 1862.

1. *ECIONEMIA COMPRESSA*, *Bow.*, II, 55; III, 19; Pl. IX, figs. 1—12.
2. *ECIONEMIA PONDEROSA*, *Bow.*, II, 56; III, 352; and Pl. VIII, figs. 8—15.

1871 *Stelletta aspera*, Carter. Ann. Nat. Hist., ser. 4, vol. vii, p. 7, pl. iv, figs. 7—14.

There can, I think, be no doubt that the sponge found by Mr. Carter at Straight Point, Budleigh-Salterton, and described by him in the 'Annals' under the name *Stelletta aspera*, is Bowerbank's *Ecionemia ponderosa*. Mr. Carter's figures of the spicula very closely resemble those of the last-named species, and the fact that he did not find the small doliolate spicula is of little moment, as they might have easily escaped him. In *Ecionemia compressa* the doliolate spicula were not recorded in the description in Vol. II, and

were only discovered after a "searching examination" (III, p. 19).

3. *ECIONEMIA COACTURA*, *Bow.*, III, 269; Pl. LXXXII, figs. 13—19.

Genus 9.—POLYMASTIA, *Bow.*, I, 177; II, 5.

1. *POLYMASTIA ORNATA*, *Bow.*, II, 58; III, 20, Pl. IX, figs. 13—16.
2. *POLYMASTIA BULBOSA*, *Bow.*, II, 61; III, Pl. X, figs. 1—4.
3. *POLYMASTIA ROBUSTA*, *Bow.*, II, 62; III, Pl. X, figs. 5—8.

1861 *Euplectella robusta*, *Bow.* List British Marine Invert. Fauna (Brit. Assoc.), p. 71.

Habitat.—Dredged in Birterbuy Bay, Connemara, by Mr. D. Robertson and myself in 1874 (N.).

4. *POLYMASTIA BREVIS*, *Bow.*, II, 64; I, Pl. XXIX, fig. 358; III, 25; Pl. XI, figs. 1—9.

1861 *Euplectella brevis*, *Bow.* List Brit. Marine Invert. Fauna (Brit. Assoc.), p. 71.

1868 *Quasillina brevis*, *Norman.* Last Report Dred. Shetland Isles (Brit. Assoc. Rep.), p. 329.

In the British Association's 'Report' of 1868 will be found the grounds on which I established the genus *Quasillina* to receive this species, and in Vol. III, p. 26,

Dr. Bowerbank gave his reasons for not recognising that genus. Let others decide the matter. This is not the occasion to defend my own views, but I may be allowed to observe that my description was not based on a single specimen, as my old friend seems to imply. I certainly have seen a far larger number of specimens, and those, too, fresh from the sea, than ever passed in a dried condition through his hands.

5. *POLYMASTIA SPINULA*, *Bow.*, II, 66; III, 27; Pl. XI, figs. 10—13.

Habitat.—Dredged in Birterbuy Bay, Connemara, 1874 (N.).

6. *POLYMASTIA RADIOSA*, *Bow.*, II, 68; III, 28; Pl. XI, figs. 14—18.

7. *POLYMASTIA MAMMILLARIS* (*Müller*).

1861 *Euplectella mammilaris*, *Bow.* List Brit. Marine Invert. (Brit. Assoc.), p. 71.

1867 *Pencillaria mammillaris*, *Gray.* Proc. Zool. Soc., p. 527.

Habitat.—Polperro, Cornwall; three miles off Dunstanborough, Northumberland; the Minch; Birterbuy Bay, Connemara (N.).

Among the specimens from the last-named locality is one of an oval form, and a little more than an inch in length, embedded in a mass of *Raphyrus Griffithsia*, which completely covers, inside and out, the gibbous valve of a *Pecten maximus*. Another fine large example from the same dredgings is about three

and a half inches in diameter, almost entirely covering the external surface of the flat valve of a *Pecten maximus*. This sponge has about one hundred and fifty fistulæ; and on the inside of the valve of the *Pecten* are three or four very thin circular or oval spots of the same sponge in a very young state, before any fistular appendages are developed.

8. POLYMASTIA CONIGERA, *Bow.*, III, 192; Pl. LXXII, figs. 13—16.

Genus 10.—HALYPHYSEMA, *Bow.*, I, 179; II, 5.

(= *SQUAMULINA*, *Carter*, but not of *Schultze*.)

1. HALYPHYSEMA TUMANOWICZII, *Bow.*, II, 76; I, Pl. XXX, fig. 359.

- 1866 *Haliphysema Tumanowiczii*, O. Schmidt. Zweite Supplement d. Spong. d. Adriatischen Meeres, p. 13, pl. i, fig. 13 (copy from Bowerbank).
- 1868 *Haliphysema Tumanowiczii*, Parfitt. Trans. Devon. Assoc. Sci. Lit. and Art., p. 14 (separate copy); and Ann. Nat. Hist., ser. v, vol. i (1878), p. 88.
- 1870 *Squamulina scopula*, Carter. Ann. Nat. Hist., ser. 4, vol. v, p. 310, pl. iv, figs. 1—11; and vol. xx (1877), p. 337; ser. 5, vol. i (1878), p. 172; vol. iii (1879), p. 407.
- 1877 *Haliphysema primordiale*, Haeckel. Biologische Studien, p. 180, pl. ix.
- 1877 *Haliphysema Tumanowiczii*, Haeckel. l. c., p. 192.
- 1877 *Gastrophysema dithalamium*, Haeckel. l. c., p. 196, pls. xii—xiv.
- 1877 *Gastrophysema scopula*, Haeckel. l. c., p. 206.
- 1878 *Squamulina scopula*, Kent. Ann. Nat. Hist., ser. 5, vol. i, p. 1.
- 1878 *Haliphysema Tumanowiczii*, Norman. Ann. Nat. Hist., ser. 5, vol. i, p. 274.

- 1878 *Haliphysema Tumanowicssii*, Kent. Ann. Nat. Hist., ser. 5, vol. ii, p. 68, pls. iv and v.
 — 1879 *Haliphysema Tumanowicssii*, H. B. Brady. Quart. Journ. Mic. Sci., N. S., vol. xix, p. 50.
 1880 *Haliphysema Tumanowicssii*, Lankester. Quart. Journ. Mic. Sci., N. S., vol. xix, p. 475, p. xxii.

Habitat.—Attached to fronds of *Rhodymenia*, Torbay (Parfitt); Budleigh-Salterton (Carter); Jersey (Kent); Bergen, Norway (Haeckel); "*H. primordialæ*," Mediterranean, Corsica (Haeckel); "*G. dithalamium*," Mediterranean, Smyrna (Haeckel).

The genus *Haliphysema* has been the subject of much controversy of recent years, for the full understanding of which the reader is referred to the several papers which are enumerated in the synonymy. It will suffice here briefly to allude to the views entertained by the respective authors.

Dr. Bowerbank described *Haliphysema* at first not only as a sponge, but as presumably a sponge which secreted its own siliceous spicula. In the second volume of this work, however, after he had received from me the type-specimens of *H. ramulosa*, he distinctly stated that the skeleton consists of "an incorporation of fragments of spicula of various shapes and sizes and of minute grains of sand." This fact I had pointed out to him in my letters.

Mr. Carter was the first to maintain that *Haliphysema* had been wrongly placed among the sponges, and that it should be located among the Rhizopoda. He found grounds for this opinion in the pseudo-septate character of the attached base of the organism, which, he argued, showed its alliance with the Foraminifera, and from the fact that on cutting an individual in two sarcode escaped which exhibited amoeboid motions.

Professor Haeckel next entered in the field, and published an elaborate essay illustrated with a number of plates. He apparently proved to demonstration that *Haliphysema* could be nothing else than a sponge, and he assigned it to that position, and as one of the simplest forms of the Cœlenterata. He described and figured *Haliphysema* as having a hollow interior everywhere lined with the "flagellated cells" or "collar-bearing monads" characteristic of sponges; furnished, moreover, with a curious single spiral line of such flagellated cells of much greater size than the rest, while at the bottom of the cavity he described and figured ovate objects which were regarded as eggs. No one at this time could have reasonably supposed anything else than that Haeckel had clearly proved *Haliphysema* to be a low type of sponge.

Meanwhile I had myself procured certain organisms from my own dredgings off Valentia and from material brought up the "Porcupine" from considerable depths in the Atlantic. These appeared to me, on the one hand, so nearly to resemble *Haliphysema* that they could scarcely belong to a different class, and, on the other, so closely approaching many of the Lituolidan Foraminifera that no line of demarcation seemed possible. In a paper in the 'Annals' I summarised what was known and had been written respecting *Haliphysema* retaining its place, in consequence of Haeckel's apparently conclusive proofs among the sponges, but criticising the genera and species which he had instituted. In this paper I described the allied organisms under the names *Technitella* and *Marsipella* as "*genera incertæ sedis*." I did not dare to separate them from the Foraminifera to which they appeared to me to be

united by a series of uninterrupted links, while on the other hand *Technitella* appeared more closely allied to *Haliphysema* than to any other animal known to me.

Shortly after this Mr. Kent, who felt most anxious to see with his own eyes what Haeckel had described and figured of the animal of *Haliphysema*, sought diligently for and succeeded in finding it at Jersey. After most careful examination of living examples, he astonished zoologists by a paper, in which he stated that a "rigid examination with the aid of a magnifying power of from 800 to as much as 2000 diameters, failed to reveal the existence of any structure corresponding with the collar-bearing flagellate zooids of ordinary sponges" such as had been figured by Haeckel. On the other hand, he witnessed such extended, delicate, and anastomosing pseudopodial action of the sarcode in the living animal, and altogether such a structure of the granular mass which occupied the whole of the interior, as to convince him that *Haliphysema* must be and could be nothing else than a Foraminifer.

Mr. Ray Lankester commenced his observations under the impression that it was impossible that the Professor of Jena could have so accurately figured and described what had in reality no existence; and he presumed, therefore, that what Haeckel had witnessed had escaped the observation of Mr. Kent. After close and most careful investigation of numerous living and preserved examples sent to him from Jersey, he found Mr. Kent's observations to be confirmed in every particular, and that the "core" or central portion of *Haliphysema* within the crust of spicula and sand grains "is a continuous mass of protoplasm, exhibiting no central cavity and devoid of 'cell-structure.'" Scat-

tered in the protoplasm are an immense number of vesicular bodies averaging $\frac{1}{1700}$ th inch in diameter, the walls of which are thick and their contents granular or else hyaline. Mr. Lankester suggests that these may be called "vesicular nuclei." At the basal portion of the core were egg-like bodies of protoplasm of much larger size than the vesicular nuclei, varying from the $\frac{1}{1100}$ th to the $\frac{1}{500}$ th of an inch in diameter. In no part of the body-substance could he find "evidence of any axial cavity comparable to the enteron of higher animals, nor the slightest trace of a breaking up of the protoplasm into areas or units corresponding to cells, with the exception of the egg-like bodies of the anterior region;" and the whole organisation points to its relationship to the Foraminifera.

Dr. K. Möbius is a third witness. He has confirmed the observations of Kent and Lankester from the examination of living specimens procured at the Mauritius, and placed the genus among the Foraminifera.

Mr. H. B. Brady, in his recent observations of classification of the Foraminifera in "Notes on some of the Reticularian Rhizopoda of the 'Challenger' Expedition" ('Quart. Jour. Mic. Sci.,' N. S., vol. xxi, 1880, p. 13), has placed *Haliphysema* together with my genera *Technitella* and *Marsipella* in the Family *Astrorhizidæ*; and here it appears to me, according to our present knowledge, is its most proper position.

Although, however, *Haliphysema* would seem to have with our present knowledge no proper *locus standi* in the present volume, it is right that it should be left here in deference to what were Dr. Bowerbank's views to the time of his death.

2. *HALYPHYSEMA RAMULOSA*, Bow., II, 79; III, Pl. XIII; fig. 1.

1870 *Haliphysema ramulosa*, Carter. Ann. Nat. Hist., ser. 4, vol. v, p. 389.

1870 *Squamulina scopula* ("branched variety"), Carter. Ann. Nat. Hist., ser. 4, vol. vi, p. 345.

1877 *Haliphysema ramulosa*, Haeckel. Biologische Studien, p. 193.

1878 *Haliphysema ramulosa*, Norman. Ann. Nat. Hist., ser. v, vol. i, p. 276.

1880 *Haliphysema Tumanowicssii*, Möbius. Beiträge zur Meeres Fauna der Insel Mauritius und den Seychellen, p. 72, pls. i and ii, fig. 1.

Habitat.—Among sponges and on rocks, between tidemarks, Budleigh-Salterton, Devon, Mr. Carter. Off coast of Florida, U.S., dredged by Pourtales (*vide* Schmidt). Roundstone Bay, Ireland (Norman).

The finest specimen I have seen of *H. ramulosa* is one for which I am indebted to the kindness of Mr. Carter, and which, from a pedicel of almost a quarter of an inch high, becomes suddenly multiramose, and terminates in seventeen heads.*

Genus 11.—*CIOCALYPTA*, Bow., I, 179; II, 5.

1. *CIOCALYPTA PENICILLUS*, Bow., II, 81; I, Pl. XXX, fig. 360; Pl. XIII, figs. 2—4.

1870 *Axinella penicillus*, Schmidt. Spongien Fauna des Atlant. Gebietes, p. 76.

2. *CIOCALYPTA LEEI*, Bow., III, 296; Pl. LXXXVI, figs. 1—4.

* This specimen will be figured in Mr. H. B. Brady's forthcoming volume on the "Challenger" Foraminifera.

Genus 12.—TETHYA, *Lamarck*, I, 181; II, 6.

1. TETHYA CRANIUM, *Lamarck*, II, 83; I, Pl. IV, figs. 77—82; Pl. XXV, fig. 343; Pl. XXXI, fig. 362; III, Pl. XIV, figs. 1—6; Pl. LXXXIX, figs. 5—8.

1870 *Tetilla cranium*, Schmidt. Spong. Atlant., Geb., p. 76.

1872 *Tethya Zelandica*, Carter. Ann. Nat. Hist., ser. 4, vol. ix, p. 417, pl. xxii, figs. 1—6, 13—17.

Tethya cranium, Carter. Loc. cit., pl. xxii, figs. 9—12.

1875 *Tethya cranium*, vars. *abyssorum* and *infrequens*, Carter. Ann. Nat. Hist., ser. 4, vol. xviii, p. 405, pl. xvi, fig. 49 (*abyssorum*), and fig. 48 (*infrequens*).

Habitat.—Dredged in deep water in the Minch in company with *Phakellia ventilabrum*, *Isodictya infundibuliformis* and *laciniosa*, and *Normania crassa*, which are also its companions in the deep waters of the Shetland Seas (N.).

Either there must be an extraordinary amount of variation in the character of the spicula of this sponge, or there are in the seas around the British Islands very closely allied species which, while agreeing in general character, may be distinguished by certain variations in their spicula. It is not without much hesitation that I here regard these forms as variations of a single species. So regarded, I cannot but feel that they give a very serious warning against basing specific character on minute spicular differentiation; and in these volumes a large number of species are established on the ground of minute spicular variation. At the same time it must be carefully borne in mind that in all other classes of animals the amount of plasticity of form and structure varies immensely, even in kindred species; and the fact that one animal or plant varies almost endlessly does

not enable us to predicate that a closely allied form will prove similarly unstable in its characters ; on the contrary, it may prove exceptionally constant to its type.

A very important question still remains unanswered among the sponges, viz. *What amount of variation in the form and proportionate size of spicula may be regarded as consistent with specific character ?* No doubt the amount of such variation will, as I have suggested, be found to differ greatly in different genera and species. Future observations must determine whether the divergencies here considered as varietal in *Tethya cranium* should or should not be rather reckoned as specific. It will be easy in such latter case to employ the names here used to designate the several varieties as indicative instead of species.

Dr. Bowerbank first pointed out that the numerous specimens of *Tethya cranium* which he had examined contained two sorts of gemmules, "which are always grouped together" (II, p. 86). These two gemmules differ in their spicules, the first having only curved fusiformi-acerates ; the second having, 1, curved fusiformi-acerates ; 2, attenuato-porrecto-ternates ; 3, attenuato-bihamates or unihamates. And he considered it "highly probable" that this difference in the structure of the gemmules is sexual.

In 1872 Mr. Carter, having examined a bottle-full of *Tethya cranium* which Dr. Bowerbank had presented to the British Museum, believed that they were divisible into two species, which he designated "*cranium*" and "*Zetlandica* ;" Dr. Bowerbank declined ('Ann. Nat. Hist.' ser. 4, vol. x, p. 58) to acknowledge the validity of the grounds on which Carter established

his *T. Zetlandica*; and Mr. Carter himself now doubts whether that form is entitled to specific rank ('Ann. Nat. Hist.,' ser. 4, vol. xviii, p. 471). I have specimens in my collection which closely agree with the characters of *Zetlandica*, but I am inclined to regard them as *cranium* in which the dermal membrane and subdermal sarcode with their bihamates have been washed away; while the consequently outstanding fasciculi of radiating porrecto- and recurvo-ternate spicula, of which the apices are broken off, give the sponge the "thick-set papillæ" which render it so different in appearance to the naked eye from the silky investiture of the same sponge when in fine condition. The differences in the gemmules appear to be those which had previously been noticed by Bowerbank.

I now proceed to notice the forms which have been met with.

TETHYA CRANIUM, *var. 1*, TYPICA.

The externally protruded spicula, arranged in whorls like the hair of the human head, and presenting a hoary, shining, asbestine appearance. The sarcode, abundantly supplied with excessively minute sigmoid-bihamate spicula (magnified 1166 diameters, III, Pl. XIV, fig. 5), measuring about $\frac{1}{2728}$ inch long. "The spiral twist of the spicules and presence of bihamates are as characteristic of the young while still within the body of the mother as they are of the adult" (Carter).

TETHYA CRANIUM, var. 2, *ZETLANDICA*, *Carter*, l. c.

Surface smooth, interrupted by thick-set papillæ irregularly disposed. Sarcodæ entirely without bihamates. The young within the body showing the same absence of bihamates, and having the spicules radiatingly arranged, but not spirally twisted (*Carter*).

TETHYA CRANIUM, var. 3, *ACUFERA*, *Norman*.

In most respects like the type, bihamates abundant ; along with the fusiformi-acerate spicula of the skeleton large numbers of *fusiformi-acuates* occur, constituting perhaps one third of the number of skeleton spicula.

A single specimen in my collection.

TETHYA CRANIUM, var. 4, *ABYSSORUM*, *Carter*, *Ann. Nat. Hist.*, ser. 4, vol. xviii, 1876, p. 405, pl. xvi, fig. 49.

Bihamates ($\frac{1}{1500}$ th inch long) twice as large as usual, and under $\frac{1}{4}$ inch object glass seen to be covered with minute vertical spines.

Abundant among the "Porcupine" dredgings in the deep sea between the North of Scotland and the Farøe Islands.

TETHYA CRANIUM, var. 5, INFREQUENS, Carter, Ann. Nat. Hist., ser. 4, vol. xviii, 1876, p. 405; pl. xvi, figs. 48 a—c.

Porrecto-ternate spicula, of remarkable form, the prongs being distally truncated and slightly expanded, so as to form a cup-shaped excavation bordered by a serrated margin, while the central canal of the spiculum on reaching the bottom of the cup-shaped cavity divides into a number of minute branches, one of which passes to each of the tooth-like processes on the margin of the cup. The recurvo-ternate spicules have the arms much more divergent, and not so recurved as in the normal *T. cranium*; and the usual bihamate flesh-spicules are altogether absent. This is certainly a most remarkable form.

One specimen, "Porcupine" Expedition, 1869, No. 57, Lat. 60° 14' N., Long. 6° 17' W., 632 fathoms, in the deep mid-channel between Scotland and Farøe.

Tethya cranium, *Phakellia ventilabrum*, and *Isodictya infundibuliformis*, are all brought up in great abundance by the hooks of the Shetland long-line men, when fishing for torsk and cod on the Haaf Banks.

When Dr. Bowerbank first commenced the study of British Sponges, the *Tethya*, &c., were considered extremely rare. Desirous of possessing these fine species, he wrote to the fishermen's agent at the Out Skerries, and said he would give sixpence each for all that he could procure. No doubt our old friend thought the offer an uncommonly safe one; but in a short time a huge keg of Sponges came (300 *Tethya*, see II, p. 84, among them!), and a nice little bill of

fifteen pounds. As he distributed his duplicates among his friends, he used to laugh over the story, which he told as a warning never to give an unlimited order. Of late years the same sort of lesson has been taught with respect to two other Sponges, *Euplectella aspergillum*, and *Hyalonema mirabile*.

2. *TETHYA COLLINGSII*, Bow., II, 87; I, Pl. II, fig. 48; III, Pl. XV, figs. 1—9.

1867 *Collingsia Sarniensis*, Gray. Proc. Zool. Soc., p. 541.

1870 *Stelletta Collingsii*, Schmidt. Spong. Atlant. Geb., p. 76.

Habitat.—On the under side of large stones at extreme low water, spring tides, at entrance of Westport Bay, Co. Mayo (N).

3. *TETHYA SCHMIDTII*, Bow., II, 89; III, Pl. XV, figs. 10—16.

1867 *Collingsia Schmidtii*, Gray. Proc. Zool. Soc., p. 541.

1870 *Stelletta Schmidtii*, Schmidt. Spong. Atlant. Geb., p. 67.

4. *TETHYA LYNCURIUM* (Linn.), II, 92; I, Pl. XXV, fig. 342; III, Pl. XV, figs. 17—22.

1862 *Tethya morum* and *Lyncurium*, Schmidt. Spong. Adriatic Meeres, p. 44.

1867 *Donatia aurantium*, Gray. Proc. Zool. Soc., p. 541.

1869 *Tethya* (*Donatia*, Gray) *Lyncurium*, Carter. Ann. Nat. Hist., ser. 4, vol. iv, p. 7, pl. ii, figs. 1—6.

1870 *Tethya Lyncurium*, Schmidt. Spong. Atlant. Geb., p. 67.

Habitat.—Tidemarks, Westport Bay, Co. Mayo; and Roundstone, Connemara (N.), Budleigh-Salterton (Carter).

5. TETHYA SPINOSA, *Bow.*, III, 279; Pl. LXXXIII, figs. 17—22.

6. TETHYA SPINULARIA, *Bow.*, II, 94; III, Pl. XV, figs. 23—30.

1867 *Spinularia tetheoides*, Gray. Proc. Zool. Soc., p. 524.

1870 *Radiella spinularia*, Schmidt. Spong. Atlant. Geb., p. 76.

Genus 13.—HALICNEMIA, *Bow.*, I, 184; II, 6.

HALICNEMIA PATERA, *Bow.*, II, 96; I, Pl. X, figs. 228—233; Pl. XXXII, figs. 363, 364; III, Pl. XV, figs. 31, 32.

Genus 14.—DICTYO CYLINDRUS, *Bow.*, I, 185; II, 6.

1. DICTYO CYLINDRUS VENTILABEUM, *Bow.*, II, 100; III, Pl. XVI, figs. 1—5.

1870 *Dictyocylindrus ventilabrum*, Schmidt. Spong. Atlant. Geb., p. 76.

2. DICTYO CYLINDRUS RAMOSUS (*Mont.*), II, 103; III, Pl. XVI, figs. 6—12.

1870 *Raspailia ramosa*, Schmidt. Spong. Atlant. Geb., p. 76.

3. *DICTYOCYLINDRUS RADIOSUS*, *Bow.*, II, 105; III, Pl. XX, figs. 5—9.

1870 *Raspailia radiosa*, Schmidt. *Spong. Atlant. Geb.*, p. 76.

4. *DICTYOCYLINDRUS HOWSEI*, *Bow.*, II, 106; III, Pl. XIX, figs. 8—13.

Habitat.—A specimen an inch and a quarter high, consisting of a short, bent pedicil, and three branched terminations, dredged in 10 fathoms, Birterbuy Bay (N.).

5. *DICTYOCYLINDRUS HISPIDUS* (*Mont.*), II, 108; III, Pl. XVII, figs. 1—5.

1870 *Raspailia (viminalis ?)*, Schmidt. *Spong. Atlant. Geb.*, p. 76.

Habitat.—In 50 fathoms off Shetland, in company with *D. stuposus* (N.).

6. *DICTYOCYLINDRUS ACULEATUS*, *Bow.*, II, 109; III, 53; Pl. XXI, figs. 5—12.

1867 *Vibulinus aculeatus*, Gray. *Proc. Zool. Soc.*, p. 545.

7. *DICTYOCYLINDRUS FASCIOLARIS*, *Bow.*, II, 110; III, Pl. XVIII, figs. 1—4.

1867 *Adreus fascicularis*, Gray. *Proc. Zool. Soc.*, p. 545.

1870 *Raspailia (stelligera ?)*, Schmidt. *Spong. Atlant. Geb.*, p. 76.

8. DICTYOCYLINDRUS VIRGULTOSUS, *Bow.*, II, 113; III, Pl. XIX, figs. 14—18.

1870 *Raspailia virgultosa*, Schmidt. Spong. Atlant. Geb., p. 76.

1876 *Dictyocylindrus virgultosus*, Carter. Ann. Nat. Hist., ser. 4, vol. xviii, p. 234, pl. xii, fig. 5, and pl. xv, fig. 27.

In the specimens procured in the "Porcupine" Expedition to the East of Shetland in 64 and 75 fathoms, Mr. Carter has described and figured the large skeleton spicules as "large, acuminate, smooth, sharp-pointed, curved suddenly or bent towards the large extremity." In this last point these spicules differ from those described in this work from my type-specimens, but in all other respects the "Porcupine" examples agree closely with those previously obtained. Similar variations, from straight-headed acuates to those which have the thick end much bent, occasionally occur in other species; for example, the club-headed spicula of *Grantia compressa*, which usually have the head much bent on one side, are occasionally found straight.

9. DICTYOCYLINDRUS PUMILUS, *Bow.*, II, 114; III, Pl. XIX, fig. 19; Pl. XXI, figs. 1—4.

1870 *Axinella pumila*, Schmidt. Spong. Atlant. Geb., p. 70.

Habitat.—An example in fine condition was found growing on the arched under surface of a large stone at extreme low water, Westport Bay, Co. Mayo (N.).

10. *DICTYOCYLINDREUS STUPOSUS* (*Mont.*), II, 116; III, Pl. XIX, figs. 1—7.

1867 *Vibulinus stuposus*, Gray. Proc. Zool. Soc., p. 545.

1870 *Basipailia stuposus*, Schmidt. Spong. Atlant. Geb., p. 76.

Habitat.—In 50 fathoms, five miles East of Balta Island, Shetland, 1867; three miles off Dunstanborough, Northumberland, 1864; the Minch, 1866; Birterbuy Bay, Connemara, 1874 (N.).

11. *DICTYOCYLINDREUS RUGOSUS*, *Bow.*, II, 119; III, Pl. XX, figs. 1—4.

1870 *Axinella rugosa*, Schmidt. Spong. Atlant. Geb., p. 76.

12. *DICTYOCYLINDREUS RECTANGULUS*, *Bow.*, III, 281; Pl. LXXXIV, figs. 1—7.

Genus 15.—*PHAKELLIA*, *Bow.*, I, 186; II, 7.

1. *PHAKELLIA ROBUSTA*, *Bow.*, II, 120; III, 54; Pl. XXI, figs. 13—17.

2. *PHAKELLIA VENTILABRUM* (*Johnston*), II, 122; III, Pl. XXII, figs. 1—7.

1866 *Phakellia ventilabrum*, Schmidt. Spong. Adriat. Meeres, zweites Supplement, p. 15, pl. i, fig. 16.

1870 *Phakellia ventilabrium*, Schmidt. Spong. Atlant. Geb., p. 61.

1876 *Phakellia ventilabrum*, Carter. Ann. Nat. Hist., ser. iv, vol. xviii, p. 239.

Habitat.—Fine in deep water in the Minch (N.). It

has been found by Schmidt among the Sponges dredged by Pourtales off Florida in 324 fathoms ('Spong. Atlant.,' p. 62); and in the "Porcupine" dredgings in the North Atlantic it was procured from the still greater depth of 640 fathoms (Carter, l. c.).

Among the editor's specimens from Shetland is one which is ten inches high, and a foot in diameter across the edge of the cup. - Another very beautiful example is only three inches high, but expands very widely, and has a greatest diameter of thirteen inches, while its surface is proliferous with seven or eight young specimens springing from it.

Genus 16.—MICROCIONA, Bow., I, 188; II, 7.

1. MICROCIONA FICTITIA, Bow., II, 124; III, 352; Pl. XXIII, figs. 1—6, and LXXXII, fig. 20.

Habitat.—Westport Bay, Co. Mayo; colour when living yellow, very glairy with abundant sarcode (N.).

One of the specimens from Westport Bay is a large mass, which measures in the dried state three and a half inches long, two and a half wide, and one and a half thick. It has numerous pieces of *Corallina* and *Nullipora*, as well as several small pebbles, embedded in its substance. It was dredged in about five fathoms.

2. MICROCIONA KENTII, Bow., III, 317; Pl. LXXXIX, figs. 9—13.

In Vol. III, p. 311, fig. 9, for "represents the type
VOL. IV. 4

specimen of the species in the cabinet of Mr. W. Saville Kent," read—"represents the largest of the specimens dredged by the Rev. A. M. Norman at Jersey." On comparing the figure with the description of the specimens, the student would be at a loss to reconcile the illustration with the account of Mr. Kent's specimen; he will, however, find the description of the specimen from which the drawing was made on page 319. Dr. Bowerbank apparently chose this specimen for illustration as being the largest he had seen, and "in a much finer condition than the type one found by Mr. Kent."

3. *MICROCIONA FRAUDATOR*, *Bow.*, III, 275; Pl LXXXIII, figs. 7—11.

4. *MICROCIONA TUMULOSA*, *Bow.*, n. sp., IV, Pl. XI, figs. 1—4.

"Sponge massive, tumulous, tumuli conical, large, parietes thick; surface minutely rugose. Oscula within the cloacal tumuli. Pores inconspicuous. Dermal membrane abundantly spiculous; spicula acerate, same size and form as those of the skeleton, dispersed. Skeleton-columns numerous, compact, long and slender, diffused; spicula acerate, rather slender. Interstitial spicula few in number, same as those of the skeleton.

"*Colour*.—In the dried state, externally dull grey, internally blood red.

"*Habitat*.—Westport Bay, County Mayo, at extreme low-water spring tides; Rev. A. M. Norman.

“*Examined.*—In the dried state.

“I received this sponge with many others from my friend the Rev. A. M. Norman for examination. It consists of two little specimens, which have evidently been united by small adhesive points near their basal portions. When thus united the two would not have exceeded an inch in diameter, and the greatest height is about half an inch. One of these small masses is composed of four comparatively large conical tumuli, each terminating in a cloacal orifice, the margin of which is slightly thickened, and is quite smooth. The other specimen, rather the largest of the two, has one large tumulus and an immature one; the large one has three terminal orifices, and appears to have been two or more tumuli fused together by close contact. The largest of the tumuli rather exceeds half an inch in height.

“The dermal membrane abounds with spicula, which are closely felted together without any approach to definite arrangement. They vary to a small extent in size, but they are in every respect the same as those of which the skeleton-columns are composed.

“The skeleton exhibits the most strikingly distinctive characters of the species. The columns are long and slender; the spicula of which they are composed are compactly cemented together, and in the specimen in course of description they are of a deep blood-red colour. The columns are completely destitute of internal defensive spicula. When the columns, passing from the basal portion of the sponge, reach the dermal membrane, they do not terminate there, but bending at an angle they continue their course in contact with the inner surface of the membrane for con-

siderable distances in various directions; and this peculiarity, combined with the slender, smooth, and blood-red colour, forms an important discriminative character of the species. The interstitial spicula are few in number and very irregularly dispersed, and they are of the same form and size as those of the other parts of the sponge.

"It is remarkable that in this species of the genus there is only one form and size of spiculum which is common to all parts of the sponge."

5. *MICROCIONA LÆVIS*, *Bow.*, II, 127; III, Pl. XXIII, fig. 7—11.

1867 *Abila lævis*, Gray. Proc. Zool. Soc., p. 539.

6. *MICROCIONA SIMPLICIOSSIMA*, *Bow.*, III, 204; Pl. LXXIII, figs. 16—19.

1868 *Microciona simplicissima*, Bowerbank. In last Report of Dredging among the Shetland Isles; Norman on Porifera, Brit. Assoc. Rep., 1868 (1869), p. 330.

7. *MICROCIONA FALLAX*, *Bow.*, II, 128.

1869 *Sophax fallax*, Gray. Proc. Zool. Soc., p. 521.

1870 *Scopalina fallax*, Schmidt. Spong. Atlant. Geb., p. 76.

8. *MICROCIONA SPINULENTA*, *Bow.*, II, 132; III, Pl. XXIV, figs. 1—6.

1870 *Eesperia spinulenta*, Schmidt. Spong. Atlant. Geb., p. 76.

Habitat.—Shetland, 1864, Messrs. Peach and Jeffreys (*vide* Bowerbank in litt. ad A. M. N.).

9. *MICROCIONA ARMATA*, Bow., II, 129; III, Pl. XXIII, figs. 17—24.

Habitat.—Shetland, 1864, Messrs. Peach and Jeffreys (*vide* Bowerbank in litt. ad A. M. N.).

10. *MICROCIONA AMBIGUA*, Bow., II, 136; III, Pl. XXV, figs. 1—9.

11. *MICROCIONA JECUSCULUM*, Bow.

1866 *Hymeniacidon jecusculum*, Bow. II, 198.

1874 *Microciona jecusculum*, Bow. III, 274, Pl. LXXXIII, figs. 1—6.

1870 *Desmacidon jecusculum*, Schmidt. Spong. Atlant. Geb. p. 76.

1876 *Microciona jecusculum*, Carter. Ann. Nat. Hist., ser. 4, vol. xviii, p. 237.

Habitat.—Carter (l. c.) records this sponge as dredged by the "Porcupine" in 374 fathoms near Cape St. Vincent (station 25), 1870, and near the Farøe Islands (station 61), 1869, in 114 fathoms.

12. *MICROCIONA PLUMOSA* (*Montagu*).

1866 *Microciona carnososa*, Bow. II, 133.

1866 *Hymeniacidon plumosus*, Bow. II, 195.

1874 *Microciona plumosa*, Bow. III, 61, Pl. XXIV, figs. 7—13.

1867 *Pronax plumosa*, Gray. Proc. Zool. Soc., p. 536.

1870 *Desmacidon plumosus*, Schmidt. Spong. Atlant. Geb., p. 76.

Habitat.—Westport Bay, Co. Mayo, N.

13. *MICROCIONA ATRASANGUINEA*, *Bow.*, II, 138; I, Pl. XXXIII, fig. 368; Pl. XXXIV, fig. 369; III, Pl. XXIV, figs. 14—19.

Habitat.—Shetland, 1864, Messrs. Peach and Jeffreys (*vide* Bowerbank in litt. ad A. M. N.); Budleigh-Salterton (Carter).*

Genus 17.—HYMERAPHIA, *Bow.*

1. *HYMERAPHIA VERMICULATA*, *Bow.*, II, 141; I, Pl. I, fig. 5; III, Pl. XXVI, figs. 1—3.

1867 *Bubaris vermiculata*, Gray. *Proc. Zool. Soc.*, p. 522.

1876 *Hymeraphia vermiculata*, var. *erecta*, Carter. *Ann. Nat. Hist.*, ser. 4, vol. xviii, p. 307, pl. xii, fig. 4, and pl. xv, fig. 26 a, b.

Habitat.—All the Shetland specimens are in the form of a very thin crust, coating stones. Among the "Porcupine" dredgings, however, were found "short, cylindrical, angular, club-shaped sponges, becoming massive, lobed, and lobulated, or compressed and expanding flabellately." These sponges were about three inches high. In anatomical and structural characters they are stated by Carter to closely resemble the encrusting forms of *H. vermiculata*, which was found with it. The localities of the specimens lie "between the North of Scotland, the Shetland and the Farøe Island, in depths varying from 114 to 640 fathoms."

* 'Ann. Nat. Hist.', ser. 4, vol. vii, 1871, p. 274.

2. *HYMERAPHIA CLAVATA*, *Bow.*, II, 143; III, Pl. XXVI, figs. 4—9.

1867 *Euryphon clavatum*, Gray. Proc. Zool. Soc., p. 521.

3. *HYMERAPHIA VERTICILLATA*, *Bow.*, II, 145; I, Pl. X, figs. 238, 239; III, 69, Pl. XXVII, figs. 1—3.

1867 *Nania verticillata*, Gray. Proc. Zool. Soc., p. 516.

1867 *Laothoe verticillata*, Gray. Ibid., p. 543.

1875 *Hymenaphia verticillata*, Carter. Ann. Nat. Hist., ser. 4, vol. xviii, p. 321, pl. xiv, figs. 21 a—p, and pl. xv, figs. 39 a, b.

Habitat.—*Hymenaphia verticillata* has been recorded by Schmidt from Florida ('Spong. Atlant. Geb.,' p. 80), and from 345 fathoms forty miles north-north-west of Shetland (station 65), 1869, by Carter in his notes on the "Porcupine" sponges.

4. *HYMERAPHIA STELLIFERA*, *Bow.*, II, 146; I, Pl. I, fig. 34; Pl. XXXIV, fig. 370; III, Pl. XXVII, figs. 4—6.

1867 *Mesapos stellifera*, Gray. Proc. Zool. Soc., p. 543.

5. *HYMERAPHIA SIMPLEX*, *Bow.*, III, 255, Pl. LXXX, figs. 2, 3.

6. *HYMERAPHIA CORONULA*, *Bow.*, III, 246; Pl. LXXIX, figs. 1—4.

1868 *Hymenaphia coronula*, Bowerbank. In last Report of Dredging among the Shetland Isles; Norman on Porifera, Brit. Assoc. Rep., 1868 (1869), p. 330.

Genus 18.—HYMEDESMIA, *Bow.*, I, 190; II, 8.

1. HYMEDESMIA INFLATA, *Bow.*, III, 248; Pl. LXXIX, figs. 5—8.

2. HYMEDESMIA OCCULTA, *Bow.*, III, 250; Pl. LXXIX, figs. 9—11.

1868 *Hymedesmia occulta*, Bowerbank. Last Report of Dredging among the Shetland Isles; Norman on Porifera, Brit. Assoc. Rep., 1868 (1869), p. 331.

3. HYMEDESMIA RADIATA, *Bow.*, II, 149; III, Pl. XXVIII, figs. 1—4; Pl. XXIX, fig. 8.

1867 *Epicles radiosus*, Gray. Proc. Zool. Soc., 521.

Habitat.—On a fossil valve of *Pecten Islandicus*, dredged by Dr. Jeffreys and myself in the Minch in 1866 (N.).

4. HYMEDESMIA INDISTINCTA, *Bow.*, III, 304; Pl. LXXXVII, figs. 1—10.

5. HYMEDESMIA PANSA, *Bow.*, n. sp., IV, Pl. I, figs. 1—4.

“Sponge coating, thin. Surface uneven. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane pellucid, aspiculous. Skeleton composed of numerous, wide, flat patches of parallel, long, slender, acuate spicula, intermixed with numerous

prostrate, attenuato-acuate, entirely spined defensive spicula. Internal defensive spicula stout and variable in length, numerous; retentive spicula arcuate, bidentate, equi-anchorate, slender, very numerous, and minute.

“*Colour*.—Dried state, amber yellow.

“*Habitat*.—Birterbuy Bay* and Roundstone Bay, County Galway, Ireland; Rev. A. M. Norman.

“*Examined*.—In the dried state.

“This sponge coats very thinly a portion of the inner surface of a fragment of a valve of a *Pecten*, upon which numerous cells of a *Lepralia* have been built, and covering a portion of these, and upon parts of the smooth surface of the shell the sponge has been produced. The surface is more or less uneven, but this character of the sponge is probably in a great degree dependent on the extraneous materials based on the shell beneath it. A portion of the sponge covers the dead cells of the *Lepralia*, while another portion is based on the smooth surface of the shell, and this assumes the form of a thin equable stratum of sponge. The portion covering the *Lepralia* had evidently been built over it while it was in a living state; as upon reversing the mounted specimen numerous defensive spicula were seen projected through the basal membrane towards the cells of the *Lepralia*, evidently as a protection against any assaults on its basal substances; but where the sponge was based on the smooth surface of the shell no defensive spicula were projected through the basal membrane, but on

* This and Roundstone Bay are two branches of the same inlet on the north side of Galway Bay. I take the spelling “Birterbuy” from the Admiralty chart, but it is also sometimes spelt Birterbie, Birterby, Birterbey, and Bertraghboy.—N.

the contrary, they were directed inward at various angles towards the dermal membrane, or were prostrate amidst the skeleton fasciculi. This especial application by the sponge of organs of defence against an unusual danger is a very remarkable fact, but it is not a solitary case, as I have met with several other similar instances of provident defences during the course of my investigations of the nature of sponge structures. Independent of those portions of sponge built over the *Lepralia* cells, there are parts of the sponge deposited upon the smooth surface of the shell that are considerably thicker and more elevated, in the form of minute hummocks, above the surrounding portions of the sponge, and such elevations are more or less opaque; but it must be observed that these characters require a power of about 100 linear, applied to a portion of the sponge in Canada balsam, to render them distinct to the eye.

“A few simple oscula were observed in the dermis of the part of the sponge examined. The pores were not detected.

“The dermal membrane is closely attached to the mass of the skeleton beneath it, and no distinctive spicula were apparent on it.

“The skeleton is remarkable in its mode of structure. It consists of numerous thin patches of spicula, disposed at various angles to each other, and in some parts they are so intermixed as to render their distinctive fascicular characters very doubtful; and the abundant intermixture of prostrate internal defensive spicula beneath and among them adds greatly to this confusion. The skeleton spicula are long and very slender, and the number, fasciculated together, vary

from three or four to so many as to render it quite impossible to count them.

"The defensive spicula are very much stouter than those of the skeleton. They are very numerous; a portion of them are based on the inner surface of the basal membrane, and are projected into the mass of the sponge at various angles, while others are prostrate on the membrane, or intermixed with the skeleton tissues.

"The arcuate, bidentate, equi-anchorate, retentive spicula, are exceedingly numerous. They are very slender, and are abundantly but irregularly disposed in every part of the structures.

"The only species of *Hymedesia* with which *H. pansa* might possibly be confounded is *H. indistincta*, which has acute, skeleton spicula, and bidentate, equi-anchorate, retentive ones, but it has no such internal defensive spicula as those which abound in *H. pansa*."

6. HYMEDESMIA PILATA, *Bow.*, n. sp., IV, Pl. II, figs. 1—4.

"Sponge coating very thinly. Surface smooth or minutely hispid. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane pellucid, rather abundantly supplied with very minute, simple or contort, bihamate, retentive spicula. Skeleton having the fasciculi rarely containing more than two or three spicula, more frequently singly dispersed; spicula attenuato-acuate, basally spinous, long and rather slender. Internal defensive spicula attenuato-acuate, entirely spinous, comparatively short and stout, very numerously projected at right angles to the membranes.

“ *Colour*.—In the dried state, dark amber-brown.

“ *Habitat*.—Birterbuy Bay, Ireland; Rev. A. M. Norman.

“ *Examined*.—In the dried state.

“ This sponge is spread very thinly on the inner surface of a fragment of a shell of *Pecten maximus*. It is one inch in length, and its greatest width does not exceed half an inch. When a portion of it mounted in Canada balsam is examined with a power of 300 linear it presents a very singular appearance. When the thickness of the sponge does not exceed about half the length of the internal defensive spicula, projected at right angles from the basal membrane through the dermal one, the surface appears minutely hispid, and the dermal membrane in a very pellucid state is distinctly to be seen with numerous minute and slender bihamate, retentive spicula dispersed on its inner surface. When the thickness of the sponge exceeds the length of the internal defensive spicula the dermal surface then appears smooth, and the membrane, abundantly furnished with dark, amber-coloured sarcode, becomes very nearly opaque, and the structures beneath are entirely obscured. In this condition its greatest thickness appears to be about twice the length of the internal defensive spicula, which measured $\frac{1}{3}\frac{1}{4}$ inch in length; so that its greatest thickness does not appear to exceed about $1\frac{1}{7}$ inch. The bihamate spicula of the dermal membrane are rather abundant, but very minute and slender, and they require a power of not less than 400 linear to show them distinctly as they lie *in situ*. The skeleton also presents very anomalous characters. The spicula of which it is composed are like those of the system of

internal defence, attenuato-acuate in form, but very much longer; a fully developed one measured $\frac{1}{111}$ inch, and in place of being entirely spined they are only spinous basally for about one third of their length, and their mode of disposition is parallel to the plane of the basal membrane, instead of at right angles to it. Their mode of disposition is also very irregular. There are rarely more than two or three fasciculated together, and by far the greater number are singly scattered amidst the interstitial tissues.

"The three forms of spicula described are the only ones that I could detect in this sponge. The nearest ally to this species in general form and habitat appears to be *Hymedesmia pulchella*, from which it is readily distinguished by the difference in the form of its skeleton and retentive spicula, and especially by the latter; but the discrimination of the two species requires close examination, as the retentive spicula of the species in course of description do not exceed $\frac{1}{1500}$ inch in length, and they are also exceedingly slender in their proportions."

7. HYMEDESMIA PULCHELLA, Bow., n. sp., IV, Pl. II, figs. 5—8.

"Sponge coating very thin and delicate. Surface minutely hispid. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane pellucid; tension spicula long and very slender, acuate; retentive spicula angulated, bidentate, equi-anchorate, minute, proportionally rather stout, very numerous. Skeleton—fasciculi loosely and irregularly formed; spicula long

and very slender, acuate; and also long and slender, attenuato-acuate, basally spinous, irregularly dispersed. Internal defensive spicula, attenuato-acuate, entirely and strongly spinous, short and stout, very numerous.

“*Colour*.—In the dried state, dark amber-brown.

“*Habitat*.—Birterbuy Bay, Ireland; Rev. A. M. Norman.

“*Examined*.—In the dried state.

“This beautiful and interesting little sponge forms an exceedingly thin patch eight lines in length and four in breadth on the inner surface of a fragment of the shell of a *Pecten maximus*. A small portion of the sponge mounted in Canada balsam exhibited the surface as abundantly and powerfully hispid. Some portions of the sponge were nearly opaque in consequence of the presence of dark amber-coloured sarcode beneath the dermis, while other parts were in a beautifully transparent state and exhibited the structural characters of the sponge in a very satisfactory manner, with the strong hispidation of the surface produced by the projection of numerous, internal, defensive spicula, through the dermal membrane for more than half their entire length. As these spicula do not exceed $\frac{1}{80}$ inch in length, it would appear that the thickness of the sponge in those parts would not exceed about $\frac{1}{80}$ inch.

“The dermal membrane appears to be abundantly supplied with the long and very slender tension spicula, but from the thinness of the sponge and the transparency of the dermal membrane it is not easily determined to which part of the sponge the numerous, single, long, and very slender spicula belong; but this uncertainty does not obtain to so great an extent

with the equi-anchorate retentive spicula, which are abundantly distributed on the inner surface of the dermal membrane.

“The skeleton fasciculi are very irregularly constructed, and they rarely contain more than four or five irregularly placed spicula; but in addition to the fasciculi there are numerous single spicula dispersed among the fasciculi, and also a considerable number of the long, slender, basally spined, attenuato-acuate spicula, which are mostly prostrate amidst the other portions of the skeleton, though occasionally a few of them have their apical extremities slightly elevated above the surface on which their bases repose. These spicula are strikingly distinct from the purely defensive ones of the sponge, from which they may be at once distinguished by their being only basally spinous, and by being about three times the length of the purely defensive ones; an average-sized one measured $\frac{1}{100}$ inch in length; they are basally spinous for about one fourth of their length; the spines are acutely conical, but neither strongly nor numerous produced, while the internal defensive ones have their spines abundantly and very strongly produced, and especially so at their bases. The latter forms, besides those projected at rather regular intervals at right angles to the basal membrane, are frequently found prostrate on the membrane, either singly or in clusters, and occasionally assume a somewhat fan-shaped mode of disposition.

“The angulated bidentate, equi-anchorate, retentive spicula are very numerous; they vary very slightly in size—a fully developed one measured $\frac{1}{1255}$ inch in length—and are rather stoutly proportioned; they require a power of about 500 linear to render them

distinctly to the eye. Delicately thin as this species is, it is profusely abundant in spicula.

"At the first sight this sponge is liable to be mistaken for *Hymedesmia indistincta*, but on a more careful microscopical examination the difference in form of the dermal tension spicula from those of *H. indistincta*, and the total absence of the entirely spined cylindrical spicula of the last-named species, at once separates them."

8. *HYMEDESMIA PEACHII*, Bow., n. sp., IV, Pl. XIII, figs. 5—12.

"Sponge coating exceedingly thin. Surface smooth, or very minutely hispid. Oscula and pores inconspicuous. Dermal membrane pellucid, aspiculous. Skeleton composed of numerous very slender, acuate spicula in flat fasciculi, irregularly dispersed; auxiliary skeleton spicula large and long, attenuato-acuate, basally spinous, irregularly dispersed, prostrate. Internal defensive spicula attenuato-acuate, entirely spined, projected from the basal membrane at right angles to its plane, comparatively small and numerous. Retentive spicula large and very stout, bidentate, equi-anchorate, moderately numerous; and rarely others of the same form exceedingly minute.

"*Colour*.—In the dried state, cream-white.

"*Habitat*.—Wick, North Britain, in deep water; C. W. Peach.

"*Examined*.—In the dried state.

"I received in 1866, from my old and indefatigable friend Mr. C. W. Peach, too late for description and

publication in vol. ii of this work, a small angular stone nearly covered by a thin cream-white incrustation, and the remains of one of the valves of a bivalve shell, the inner surface of which was nearly entirely coated with the same sort of incrustation. He stated on labels attached to them that they were from deep water at Wick, North Britain. The crust was spread over three sides of the angular pebble so thinly that it was with some difficulty that I could detach portions of it for microscopical examination after having immersed it in water; its thickness not exceeding $\frac{1}{31}$ inch. When a portion of it is mounted in Canada balsam and examined with a power of about 200 linear it becomes a remarkably interesting object, abounding in strikingly characteristic organs. The dermal membrane is so thin and pellucid that it can only be recognised by the small specks of extraneous matters adherent to its surface, and neither oscula nor pores can be detected. The minute hispidation of the surface can only be perceived in portions of the sponge when mounted in Canada balsam; it is produced by the passage of small portions of the distal extremities of the internal defensive spicula through the dermal membrane.

“The skeleton fasciculi are clearly unequally distributed through its substance; in some cases they are grouped together rather numerously, while in others they occur singly, or two or three of them are closely adjoining each other; and occasionally single spicula are irregularly dispersed. The fasciculi are composed of very slender acuate spicula, each fasciculus containing a considerable number of them closely disposed in parallel lines; but although thus slender they are undoubtedly the legitimate representatives of the

fasciculated skeleton of a true *Hymedesmia*; while the dispersed, large, basally spined, attenuated acuate ones, from their prostrate mode of disposition, form a strong auxiliary skeleton destined to compensate the slender and fragile structures of the true skeleton fasciculi, and as well to aid and assist in the preservation of the sponge, as defensive organs, in addition to the true internal defensive spicules of the sponge.

"From the extreme tenuity of the true skeleton spicula they might readily, and especially the dispersed ones, be mistaken for tension spicula, and especially so when compared with the numerous and comparatively gigantic auxiliary basally spined, attenuato-acuate ones, which are distributed rather numerous amongst them.

"The disparity existing between the two portions of the skeleton structures is very remarkable. One of the normal skeleton spicula of the fasciculi was $\frac{1}{178}$ inch in length, and its greatest diameter measured only $\frac{1}{15000}$ of an inch; while the length of one of the large attenuato-acuate, basally spined spicula was $\frac{1}{67}$ inch, and at its greatest diameter near the base it was $\frac{1}{2307}$ inch.

"The attenuate, entirely spined, acuate, internal defensive spicula are all projected from the basal membrane at about right angles to its plane, and their apices frequently pass through the dermal membrane, thus performing the double office of internal, and to a certain extent external defences. We may, therefore, estimate the thickness of the sponge as about equivalent to the average length of these organs, one of the largest of which measured $\frac{1}{231}$ inch in length.

"The retentive spicula are also very characteristic of

the species. The large bidentate equi-anchorate ones are larger and stouter in their proportions than is usual with this form of spiculum. A fully developed one measured $\frac{1}{800}$ inch in length, and its shaft was $\frac{1}{8000}$ inch in diameter. They are rather sparingly dispersed on the surface of the basal membrane, to which they are usually attached by the middle of the curved shaft. Occasionally but rarely a tridentate one occurs, but this form is the exception and not the rule. They vary to a considerable degree in size, form, and in the completeness of the development of their anchorate terminations.

“The minute, bidentate, anchorate spicula are very few in number and extremely minute; one of them measured only $\frac{1}{2000}$ inch in length. They are usually completely immersed in the sarcode and are very indistinctly seen.

“This species is readily separable from *Hymedesmia pansa* or *pulchella*, its nearest known allies, by the striking differences in the forms of the bidentate, equi-anchorate spicula; which in this species greatly exceed in size and stoutness, as well as differ in form from, those of either of the above-named species, and also by the possession of the exceedingly minute equi-anchorate spicula intermixed sparingly with the larger ones. In other respects also it differs in its structures, but in a less striking manner from those of *H. pansa* and *pulchella*.”

9. HYMEDESMIA STELLATA, Bow., II, 150; III, Pl. XXVIII, figs. 5—8.

1867 *Timea stellata*, Gray. Proc. Zool. Soc., p. 544.

10. *HYMEDESMIA SIMPLICISSIMA*, *Bow.*, III, 253 ; Pl. LXXX, fig. 1.

11. *HYMEDESMIA TENUICULA*, *Bow.*, n. sp., IV, Pl. I, fig. 5.

"Sponge coating, very thin. Surface even, smooth. Oscula simple, minute, dispersed. Pores inconspicuous. Skeleton fasciculi variable, flat ; spicula few or very numerous in each, bases and apices coincident, attenuato-spinulate, long, slender, minute, variable in size.

"*Colour*.—Alive, deep blue ; in spirit, light blue.

"*Habitat*.—Roundstone Bay, Connemara, Ireland ;
Rev. A. M. Norman.

"*Examined*.—From spirit.

"Among the specimens of Irish sponges that I received for examination from the Rev. A. M. Norman there were two small fragments of granite, the largest being seven lines in length by four lines in breadth, and the smaller one being not half the size of the largest. On each of these there were minute patches of a dull, pale blue colour as taken from the spirit, but which, from the label on the bottle, were of a deep blue colour when alive. The thickness of the sponge does not exceed that of a sheet of writing paper. When a portion of the sponge was mounted for microscopical examination with a power of 100 linear, scarcely any of the spicula were visible amidst the sarcode, which presented a strongly gelatinous appearance in the water ; but when mounted in Canada balsam they became completely visible. The structures of the sponge are very simple ; one form of

spiculum only being present, the long, slender, attenuato-spinulate. They are very minute, requiring a power of about 200 linear to render their proportions distinctly to the eye. They vary to a very considerable extent in their length and diameter. Two fully developed ones measured as follows:—The longest was $\frac{7\frac{1}{2}}{59}$ inch in length and its greatest diameter was $\frac{8\frac{1}{8}}{18}$ inch; the shortest $\frac{3\frac{1}{3}}{33}$ inch in length, but its greatest diameter exceeded that of the longest one, being $\frac{1}{555}$ inch. Both these spicula were more than twice the diameter of many of the other spicula around them.

“The disposition of the skeleton fasciculi is very irregular, and the number of spicula contained in each exceedingly variable. In some portions of the sponge they consist of large flat bundles loosely congregated, while in others they are much more compact, and in many cases they are formed of but two or three spicula; the bases and apices of the spicula forming each fasciculus are almost always coincident.

“There is no other known species of the genus *Hymedesmia* with which this one is liable to be confounded.

“Mr. Norman states that ‘this species occurs in Roundstone Bay, Galway, in small patches on the under side of stones at extreme low water. Its colour is a brilliant deep blue. It has long been known to me by sight on other parts of the coast, and I have often preserved it by drying the specimens, which shrivelled up to nothing.’

“On examining some old stores of specimens sent to me in May, 1866, by my highly esteemed friend Mr. C. W. Peach too late for publication in vol. ii, I found

a small slab of dark-coloured slate, two inches long by one and a half inch wide, with twenty-two small, very thin patches of a light grey-coloured sponge scattered over the surface. The greater portion of them were of a nearly circular form, varying in size from one or two lines in diameter to the largest four lines in diameter. On mounting portions of some of the largest of them in Canada balsam they all proved to be specimens of *Hymedesmia tenuicula*, agreeing in all their structural characters with those of the type-specimen. My friend Mr. Peach states the locality of the specimens sent to me to be Wick, Scotland."

12. *HYMEDESMIA ZETLANDICA*, Bow., II, 152; III, Pl. XXIX, figs. 1—7.

1867 *Hymedesmia Zetlandica*, Gray. Proc. Zool. Soc., p. 537.

Genus 19.—*HYMENIACIDON*, Bow., I, 191; II, 154.

1. *HYMENIACIDON ALBESCENS* (Johnston), II, 161; III, Pl. XXXI, figs. 6—10.

1867 *Reniera albescens*, Gray. Proc. Zool. Soc., p. 518.

1870 *Amorphina albescens*, Schmidt. Spong. Atlant. Geb., p. 76.

"On the 21st of September, 1874, I received from my friend Mr. Higgin a specimen of *Hymeniacidon albescens* from the shore near Holyhead for examination. It was found pendent on the under sides of stones on the beach near low-water mark. It was, as nearly as possible, of the same size as the one represented by fig. 9, Plate XXXI, from Torbay, and it agreed

with it in its structural peculiarities in every part of the sponge."

2. HYMENIACIDON THOMASII, Bow., II, 155; [III, Pl. XXX, figs. 1—3

1867 *Reniera Thomasii*, Gray. Proc. Zool. Soc., p. 518.

1870 *Amorphina Thomasii*, Schmidt. Spong. Atlant. Geb., p. 76.

"I received a small specimen of *Nullipora polymorpha* from the Rev. A. M. Norman, about one inch in length, amid the short branches of which a small mass, rather exceeding half an inch in diameter, of a sponge of a dull ochreous yellow colour, was immersed. On a microscopical examination, this proved to be *Hymeniacidon Thomasii*, but bearing not the slightest resemblance in form or external characters to the type specimen described in vol ii, p. 155, and figured in Vol. III, Plate XXX, fig. 1, 'Mon. Brit. Spongiadæ.' Although so small a specimen, the anatomical characters were as fully developed as in the type specimen. It would appear that this species is of rare occurrence, as this is the only other specimen I have seen, excepting the type. The small specimen described above was dredged in Westport Bay, Ireland, in five fathoms, by the Rev. A. M. Norman."

3. HYMENIACIDON COCCINEUS, *Bow.*, II, 156; III, 353,
Pl. XXX, figs. 4—6.

1861 *Halichondria coccinea*, Bowerbank. List Brit. Marine
Invert. Fauna (Brit. Assoc.), p. 69.

1867 *Reniera coccinea*, Gray. Proc. Zool. Soc., p. 518.

1870 *Amorphina coccinea*, Schmidt. Spong. Atlant. Geb.,
p. 76.

Habitat.—A small, massive specimen, rather more than half an inch measured every way, was dredged off the Durham Coast in 20—35 fathoms (N).

4. HYMENIACIDON LACTEUS, *Bow.*, II, 163; III, 82, Pl.
XXXII, figs. 9, 10.

1867 *Reniera lactea*, Gray. Proc. Zool. Soc., p. 518.

1870 *Amorphina lactea*, Schmidt. Spong. Atlant. Geb., p. 76.

Habitat.—“Guliot caves, Sark. Mr. Hughes”
(J. S. B.).

5. HYMENIACIDON PERARMATUS, *Bow.*, II, 164; III, Pl.
XXXI, figs. 11—16.

1867 *Anchinœ perarmata*, Gray. Proc. Zool. Soc., p. 535.

1870 *Desmacidon perarmatus*, Schmidt. Spong. Atlant. Geb.,
p. 76.

6. HYMENIACIDON MEMBRANA, *Bow.*, II, 165; III, Pl.
XXXII, figs. 11, 12.

1867 *Reniera membrana*, Gray. Proc. Zool. Soc., p. 518.

1870 *Amorphina membrana*, Schmidt. Spong. Atlant. Geb.,
p. 76.

7. HYMENIACIDON FIRMUS, *Bow.*, III, 186; Pl. LXXII, figs. 1, 2.

Habitat.—Among Dr. Bowerbank's notes is—"I received a very few small fragments of this sponge for examination from the Rev. A. M. Norman, labelled 'Yellow, Westport Bay.' The microscopical sections were in all respects identical with those of the type specimen."

8. HYMENIACIDON PLACENTULA, *Bow.*, III, 189, 353; Pl. LXXII, figs. 5—9.

9. HYMENIACIDON ARMIGER, *Bow.*, n. sp., IV, Pl. IV, figs. 10—17.

"Sponge coating, thin. Surface smooth and even. Oscula simple, minute. Pores inconspicuous. Dermal membrane pellucid, abundantly spiculous; tension and defensive spicula attenuato-acuate, entirely spinous, irregularly dispersed, variable in size; retentive spicula bidentate or tridentate, equi-anchorate, very minute, rather numerous. Skeleton—spicula fusi-formi-acerate, numerous, small, and rather short; internal defensive spicula same as those of the dermis, few in number; retentive spicula same as those of the dermis, not numerous.

"*Colour.*—In the dried state, cream-white.

"*Habitat.*—Roundstone Bay, Ireland; Rev. A. M. Norman.

"*Examined.*—In the dried state.

"This sponge is entangled amid the branches of a small specimen of *Nullipora polymorpha*, coating them rather thinly. Its organic structures are very remarkable, and afford very distinct and striking specific characters, especially those of the dermis. The dermal membrane is very pellucid, and is crowded with the stout, entirely spined tension and defensive spicula; they are all prostrate, thus assuming the character of tension spicula, but their forms and abundant spination render them equally available as defensive organs; the mode of their disposition has no approximation to order, and I could not detect any of them projected at an angle from the membrane on which they are disposed. The retentive spicula are very minute, but rather numerous, especially in those spaces least furnished with the defensive spicula. The armature of this sponge against either its large or its minute foes is very complete. The largest of two of the bidentate equi-anchorate, retentive spicula measured $\frac{1}{1300}$ inch long, the smallest was $\frac{1}{1765}$ inch, the average length of three was $\frac{1}{1644}$ inch, and they require a power of about 500 linear to render them distinctly to the eye. The skeleton structure is rather open and cavernous, and the membranes are abundantly furnished with their fusiformi-acerate spicula amid which the attenuato-acuate, entirely spined defensive spicula are present in some parts rather sparingly, while in other parts they are more abundant. The minute anchorate, retentive spicula are also rather sparingly disposed on the surfaces of the skeleton membranes.

"Insignificant as this sponge appears to the unassisted eye, it is, by the striking peculiarities of its

structure, a remarkably well-characterised species, and cannot well be mistaken for any other nearly allied British sponge with which we are at present acquainted."

10. *HYMENIACIDON BRETTHI*, *Bow.*, II, 158; III, Pl. XXX, figs. 7—9.

1867 *Reniera Brettii*, Gray. Proc. Zool. Soc., p. 518.

1870 *Amorphina Brettii*, Schmidt. Spong. Atlant. Geb., p. 76.

Habitat.—Dredged in Saints Bay, Guernsey, 1865 (N.).

11. *HYMENIACIDON FRAGILIS*, *Bow.*, II, 159; III, Pl. XXX, figs. 10—12.

1867 *Reniera fragilis*, Gray. Proc. Zool. Soc., p. 518.

1870 *Amorphina fragilis*, Schmidt. Spong. Atlant. Geb., p. 76.

12. *HYMENIACIDON RETICULATUS*, *Bow.*, II, 159; III, 77, Pl. XXXI, figs. 1—3.

1867 *Reniera reticulata*, Gray. Proc. Zool. Soc., p. 518.

1870 *Amorphina reticulata*, Schmidt. Spong. Atlant. Geb., p. 76.

Habitat.—Strangford Lough (N.).

13. *HYMENIACIDON FALLACIOSUS*, *Bow.*, II, 160; III, 78, Pl. XXXI, figs. 4, 5.

1867 *Reniera fallaciosa*, Gray. Proc. Zool. Soc., p. 518.

1870 *Amorphina fallaciosa*, Schmidt. Spong. Atlant. Geb., p. 76.

Habitat.—A curiously formed specimen has been found by me in Westport Bay. It is located on an old valve of *Pecten varius*, and has apparently thrown a coating over a fair-sized piece of *Nullipora polymorpha*, filling up the interstices of and covering over the Nullipore, and attaching it by its own structures to the shell on which it rests. The entire size of the sponge is one and a half inch long, one and a quarter broad, and not quite an inch high (N.).

14. HYMENIACIDON TEGETICULA, *Bow.*, III, 216, Pl. LXXIV, figs. 16, 17.

15. HYMENIACIDON SOLIDUS, *Bow.*, n. sp., IV, Pl. III, figs. 4—7.

“Sponge basally massive, developing upward into a thick stout virgultose branch; surface even, smooth. Oscula simple, depressed. Pores inconspicuous. Dermis abundantly spiculous, reticulated irregularly, and bi- or trispiculous; spicula subfusiformi-acerate, long, and stout. Skeleton open and diffuse, abundantly spiculous; spicula acerate or subfusiformi-acerate, a few large and stout like those of the dermis, the greater portion long and slender.

“*Colour*.—Dried state, dark brown.

“*Habitat*.—Westport Bay, Ireland, 5 fathoms; Rev. A. M. Norman.

“*Examined*.—In the dried state.

“The irregularly-shaped basal mass of this sponge is

two inches in length, one in breadth, and one in height, and incorporated in it are several small pebbles, and a small branching specimen of *Nullipora polymorpha*. From about the middle of the mass there rises an irregular stick-like branch three inches in height, rather exceeding half an inch in diameter. The surface is slightly corrugated in its present condition, but this is evidently the result of drying. The oscula are small and not very readily detected, excepting a few rather larger than the rest, upon the basal portion of the sponge. The most striking distinctive characters are those of the dermis, the form and mode of the reticulation of which differs essentially from that of its nearest allies. The rete is very irregular, and the areas very angular in consequence of its being constructed of numerous fasciculi of rather large and long spicula, which vary in number from two to four or five in each fasciculus; and also from the fasciculi being disposed on the membrane in a very irregular manner, crossing each other at a variety of angles; the spicula, unlike those of the skeleton, are all large and uniform in size, while those of the skeleton-tissues are very variable in their diameters, and very few of them equal in size and robustness to those of the dermis.

“The only two known British species with which this sponge might possibly be confounded are *Hymeniacidon reticulatus* and *H. tegeticula*. The dermal membrane of *H. reticulatus* differs considerably from that of *H. solidus*, inasmuch as it is more regularly reticulated; the rete is stronger and multispiculous, and the areas more regularly produced; and the spicula, although of the same form as those of *H. solidus*, are

very little more than half their size. The colours and mode of growth of the two sponges also differ to a very considerable extent.

"There are similar differences existing between the sponge in course of description and *H. tegeticula*, in which the skeleton spicula are much shorter than those of *H. solidus*, and exhibit none of the marked inequalities of size and diameter that are so characteristic of that species, but, on the contrary, are very equable in size and proportions. In the dermal membrane the two species differ also to a very considerable extent. In *H. tegeticula* the dermal spicula are more or less felted together, instead of presenting a well-defined but irregular reticulation. The colour and mode of growth are also strikingly different from those of *H. solidus*. If any doubts remain regarding the discrimination of the three species, the comparative measurements of their spicula will readily determine the question. Thus the large spicula of *H. solidus* measure $\frac{1}{3}\frac{1}{5}$ inch in length, and have their greatest diameter $\frac{1}{2000}$ inch. *H. reticulatus* has its largest spicula $\frac{1}{9}\frac{1}{1}$ inch in length, and the greatest diameter $\frac{1}{3000}$ inch. *H. tegeticula* has its largest spicula $\frac{1}{8}\frac{1}{1}$ inch in length, and their greatest diameter $\frac{1}{2808}$ inch.

"I have since the above description was written received another specimen of this from Mr. Norman, which differs in its external characters from the type. It is a small, irregularly shaped mass an inch and a half in length, embracing a small fragment of stone, from which it does not project itself as the type-specimen does. It also differs in colour, being nearly cream-white. Anatomically it agrees perfectly with the type-specimen."

16. HYMENIACIDON PERLÆVIS (*Montagu*), II, 179; III, Pl. XXXIV, figs. 1, 2.

1867 *Beniera perlævis*, Gray. Proc. Zool. Soc., p. 518.

Habitat.—Bantry Bay (N.).

17. HYMENIACIDON PACHYDERMA, *Bow.*, II, 184; III, Pl. XXXIV, figs. 10, 11.

1867 *Beniera pachyderma*, Gray. Proc. Zool. Soc., p. 518.

18. HYMENIACIDON CRUSTULA, *Bow.*, II, 185; III, Pl. XXXIV, figs. 3—6.

1867 *Beniera crustula*, Gray. Proc. Zool. Soc., p. 518.

19. HYMENIACIDON HILLIERI, *Bow.*, n. sp., IV, Pl. III, figs. 1—3.

“Sponge massive, sessile. Surface smooth and even. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane aspiculous. Skeleton dense, abundantly spiculous. Spicula acuminate, rarely subspinulate; closely felted together in all parts of the sponge. Sarcode at the surface nearly black, opaque; internally light coloured and semi-transparent.

“*Colour*.—In the living state, dark brown, nearly black. In the dried state, dark nut brown.

“*Habitat*.—On oyster shells from the Ridge off Dover; James F. Hillier, Esq., of Ramsgate.

“ *Examined*.—Fresh from the sea.

“ The external aspect of this sponge is so like that of *Battersbyia Bucklandi*, being of the same dark colour, and of a similar degree of solidity, that it may readily be mistaken for that sponge by a superficial observer, but the slightest attempt at a microscopical examination of its structural characters will at once distinguish it from that species. The oscula were all closed, but the position of several of them, by the aid of a lens of two inches' focus, was apparent from the small depressed areas on the dermal surface. The characters of the dermal membrane are not readily to be determined, as it is closely adherent to the dense complicated mass of the spicula of the skeleton beneath it, but in the few spots where its structure was apparent I could not detect the slightest traces of characteristic dermal spicula or of any especial arrangement of the forms common to the whole mass of the sponge.

“ The skeleton spicula are closely felted together without the slightest approximation to arrangement at any part of the sponge, and it is only at a few internal cavities that the interstitial membranes are visible, and they, like the dermal one, are aspiculous. The colour of the sarcode is very nearly black at both its upper and basal surfaces when the sponge is fresh and in a wet condition. When a section at right angles to the surface is mounted in Canada balsam and viewed by transmitted light with a power of about 100 linear, the colour and opacity is seen to gradually decrease until the internal portions of the structures are pale in colour and transparent. The greater portion of the skeleton spicula are purely acuate in form, but a few of them exhibit more or less of a tendency to spinulation.

They vary to some extent in diameter and length. One of the largest measured $\frac{7}{10}$ inch in length, and one of the smallest $\frac{1}{18}$ inch in length, but by far the greater portion of them are of intermediate lengths.

"I have named this interesting species after my friend Mr. Hillier, of Ramsgate, an ardent and successful student of the British sponges and other branches of marine natural history, to whom I am indebted for my knowledge of the species and for other similar interesting specimens."

20. HYMENIACIDON CARUNCULA, *Bow.*, II, 166; III, Pl. XXXII, figs. 1—4.

1867 *Reniera caruncula*, Gray. Proc. Zool. Soc. p. 518.

1870 *Amorphina caruncula*, Schmidt. Spong. Atlant. Geb., p. 76.

Habitat.—On rocks between tide-marks, Westport Bay, 1874. This is one of the regular tide-mark sponges of our southern and western coasts (N.).

21. HYMENIACIDON SANGUINEUS (*Grant*), II, 168; III, 81, Pl. XXXII, figs. 5—8.

1867 *Reniera sanguinea*, Gray. Proc. Zool. Soc., p. 518.

1867 *Amorphina sanguinea*, Schmidt. Spong. Atlant. Geb., p. 76.

Habitat.—On rocks, low water, Westport Bay. This is another littoral species, very generally diffused, though apparently more common in the south (N.).

"Among some specimens of sponges collected in the Guliot Caves at Sark by Mr. Hughes, of Birming-

ham, and sent to me for examination I found a specimen of *H. sanguineus* partially covering a small mass of *Halichondria panicea*. The combined mass was about two inches in length and rather exceeding half an inch in thickness. This sponge occurs in many localities on the coasts of Scotland and Ireland, but this is the first time I believe that it has been taken so far southward as the Channel Islands."

22. HYMENIACIDON MAMMEATUS, *Bow.*, II, 170; III, 83,
Pl. XXXIII, figs. 1—4.

1867 *Reniera mammeata*, Gray. *Proc. Zool. Soc.*, p. 518.

Habitat.—Shetland, 1858; Westport and Roundstone Bay, Ireland, 1874 (N.).

"I received from the Rev. Mr. Norman two specimens of this species. One from Roundstone Bay, three inches in length, one and a half in breadth, and about half an inch in thickness. This specimen agrees in all its characters with the type. The second specimen was from Westport Bay. It was an irregularly oval mass, the greatest length not exceeding eight lines. Anatomically it was identical with the type specimen and the larger one described above, but in form and surface it differed widely from both of them, there being scarcely an indication of the remarkable mammiform organs that are so characteristic of the mature specimens, and the colour instead of being nut-brown was nearly cream-white."

23. HYMENIACIDON CONSIMILIS, *Bow.*, II, 172; III, Pl. XXXIII, figs. 5, 6.

1867 *Beniera consimilis*, Gray. Proc. Zool. Soc., p. 518.

1870 *Amorphina consimilis*, Schmidt. Spong. Atlant. Geb., p. 76.

Habitat.—I have found this species in a second locality, Westport Bay, Co. Mayo; the specimen is very like in its general characters to the types from the Channel Islands (N.).

24. HYMENIACIDON MACILENTUS, *Bow.*, II, 176; III, Pl. XXXIII, figs. 7—13.

1867 *Carmia macilenta*, Gray. Proc. Zool. Soc., p. 537.

1870 *Desmacidon macilentus*, Schmidt. Spong. Atlant. Geb. p. 76.

1871 *Carmia macilenta*, Carter. Ann. Nat. Hist., ser. 4, vol. vii, p. 276, pl. xxii, fig. 8 a—d.

Habitat.—Carter finds this species on the South-Devon Coast, and has also met with a small fragment, not larger than a pin's head, from the West Indies, and of which he figures the spicules (l.c.).

25. HYMENIACIDON FALLAX, *Bow.*, II, 177; III, Pl. XXXIII, figs. 15—18.

1861 *Halichondria fallax*, Bowerbank. List. Brit. Mar. Invert. Fauna (Brit. Assoc.), p. 69.

1867 *Beniera fallax*, Gray. Proc. Zool. Soc., p. 518.

26. HYMENIACIDON VIRGULTOSUS (*Johnston*), II, 193; III, Pl. XXXV, figs. 1—5.

1867 *Beniera virgultosa*, Gray. Proc. Zool. Soc., p. 518.

27. *HYMENIACIDON RADIOSUS*, *Bow.*, III, 187; Pl. LXXII, figs. 3, 4.

28. *HYMENIACIDON MEDIUS*, *Bow.*, III, 291; Pl. LXXXV, figs. 11—13.

“Among the specimens of sponges received for examination from the Rev. A. M. Norman, were two specimens of this species. One from Westport Bay was about two inches in diameter and five lines at greatest thickness. The colour of this specimen was darker than that of the type. The second specimen was from Roundstone Bay, Galway. Its form was eccentric, a small mass from which two small lobes, each about three lines in diameter, were projected in opposite directions for nearly an inch in length. The colour of this specimen was like that of the type. Both specimens agreed in every respect with the structural peculiarities of the type.”

29. *HYMENIACIDON ALDOUSII*, *Bow.*, III, 347; Pl. XCII, figs. 9—11.

30. *HYMENIACIDON VIRGULATUS*, *Bow.*, n. sp., IV, Pl. IV, figs. 4, 5.

1875 *Hymeniacion virgulatus*, Bowerbank. Brit. Assoc. Report, 1875 (1876), p. 199.

“Sponge virgultose, slender. Surface smooth. Oscula simple, dispersed. Pores inconspicuous. Dermis

abundantly spiculous; spicula acuate, slender, same size as those of the skeleton, dispersed. Skeleton rather open and cavernous, abundantly spiculous; spicula acuate, long, and slender.

“*Colour*.—In the dried state, cream-white.

“*Habitat*.—Coast of Durham, in 20 to 35 fathoms;
Rev. A. M. Norman.

“*Examined*.—In the dried state.

“I received a single specimen of this sponge from my friend the Rev. A. M. Norman. It slightly exceeds one inch in height, and its diameter averages about two lines; there is no natural base to it, so that its height may have been greater than it is at present. The structure of the sponge is very simple; there is but one form of spiculum, a slender and rather long acuate, which is of the same size and proportions in both dermis and skeleton membranes, and in both they appear to be about equally numerous. In the form and size of the spicula and in their mode of disposition in the sponge this species closely approaches *Hymeniacidon medius*, but the skeleton spicula do not appear to be at all subfusiform as in the last-named species. It differs also in its colour, and especially so in its external form.”

31. *HYMENIACIDON VARIANS*, Bow., II, 174; III, Pl. XXXIII, fig. 14. Pl. XLV, figs. 32—34.

1861 *Halichondria variantia*, Bowerbank. List Brit. Marine Invert. Fauna (Brit. Assoc.), p. 69.

1867 *Asychus variantia*, Gray. Proc. Zool. Soc., p. 539.

1870 *Desmacidon varians*, Schmidt. Spong. Atlant. Geb., p. 76.

32. HYMENIACIDON VIRIDANS, *Bow.*, II, 178; III, 85;
Pl. XXXII, figs. 19—22.

1867 *Reniera viridans*, Gray. Proc. Zool. Soc., p. 518.

Habitat.—Found by Mr. Peach in Shetland in 1864
(*vide* Bowerbank in litt. ad A. M. N.).

33. HYMENIACIDON AUREUS (*Montagu*), II, 181; III, 88.
Pl. XXXIV, figs. 7—9.

1867 *Reniera aurea*, Gray. Proc. Zool. Soc., p. 518.

1870 *Amorphina aurea*, Schmidt. Spong. Atlant. Geb., p. 76.

Habitat.—Between tide marks Tobermory, Isle of Mull (N.).

34. HYMENIACIDON ARMATURUS, *Bow.*, II, 183; III, Pl.
XXXIV, figs. 12—15.

1867 *Reniera armatura*. Gray. Proc. Zool. Soc., p. 518.

35. HYMENIACIDON CALLOSUS, *Bow.* n. sp., IV, Pl. IV,
figs. 6—9.

“Sponge massive, unattached. Surface coriaceous, minutely hispid and slightly rugose. Oscula and pores inconspicuous. Dermis slightly coriaceous; abundantly spiculous, spicula acuminate, arranged in a dense closely constructed network; rete rough, stout, and bristling with defensive spicula; areas small and irregular. Skeleton spicula acuminate, numerous, rather larger than those of the dermis.

“*Colour*.—In the dried state, light fawn-yellow.

“*Habitat*.—Westport Bay, Co. Mayo, Ireland, at low tides; Rev. A. M. Norman.

“*Examined*.—In the dried state.

“I received two small specimens of this sponge for examination from my friend the Rev. A. M. Norman. The largest of the two did not exceed an inch in length by half an inch in breadth, and the smallest one was half an inch in diameter. On neither of them was there any mark of having been attached to any base; the appearance of the surface in both was that of dirty, slightly corrugated kid-glove leather of a fawn-yellow colour, and to the unassisted eye the surface appeared smooth, but minutely wrinkled. When a section of the sponge at right angles to its surface mounted in Canada balsam is viewed beneath the microscope, the aspect is very different; the surface is then seen bristling with a dense stratum of acuate spicula disposed at about right angles to the surface. When a small portion of the dermis is submitted to examination in Canada balsam with a power of 100 linear, it is seen to be furnished with a coarsely formed dermal network, the rete of which has almost as great a diameter as that of the areas of the network, and from the outer surface of this reticulate structure the abundant crop of external defensive spicula are projected; these spicula and those of the network are all of the same form and size, as nearly as possible, and purely acuate.

“The skeleton does not present any especial specific characters; it is abundantly supplied with acuate spicula, very similar in size and form to those of the dermis, and no other form of spiculum is found in the structures of this sponge; but it is satisfactory that

the striking peculiarities of the dermal system renders it readily distinguishable from any other known British species of Hymeniacidon."

36. HYMENIACIDON PLUMIGER, *Bow*, III, 191; Pl. LXXII, figs. 10—12.

37. HYMENIACIDON SUBEREUS (*Montagu*), II, 200; III, Pl. XXXVI, figs. 1—4.

1861 *Halina suberea*, Bowerbank. List Brit. Marine Invert. Fauna (Brit. Assoc.), p. 70.

1862 *Suberites domuncula*, Schmidt. Spong. Adriat. Meeres, p. 67.

1867 *Suberites suberea*, Gray. Proc. Zool. Soc., p. 523.

1870 *Suberites domuncula*, Schmidt. Spong. Atlant. Geb., p. 76.

38. HYMENIACIDON CARNOSUS (*Johnston*), II, 203; III, Pl. XXXVI, figs. 5—9.

1861 *Halina carnosus*, Bowerbank. List Brit. Marine Invert. Fauna (Brit. Assoc.), p. 70.

1867 *Suberites carnosus*, Gray. Proc. Zool. Soc., p. 523.

1870 *Suberites carnosus*, Schmidt. Spong. Atlant. Geb., p. 76.

Habitat.—Birterbuy Bay, abundant on shells of *Pecten maximus*, *Turritella terebra*, *Lutraria oblonga*, and other species (N.).

39. HYMENIACIDON GELATINOSUS, *Bow*., II, 222; III, Pl. XXXVIII, figs. 7, 8.

1867 *Suberites gelatinosa*, Gray. Proc. Zool. Soc., p. 523.

Habitat.—The locality of the type-specimen is

wrongly given (II, 222) as "Dourie Voe, Shetland;" I found it between tide-marks at Cullercoats, Northumberland. The mistake probably arose from the circumstances that at the time this species was sent to Dr. Bowerbank to examine, there were also sent specimens of *Hymeniacidon carnosus* which were from Dourie Voe (N.).

40. HYMENIACIDON FOLIATUS, *Bow.*, III, 182; Pl. LXXI, figs. 1, 2.

41. HYMENIACIDON FICUS (*Johnston*), II, 206; III, Pl. XXXVI, figs. 10—17.

1861 *Halina ficus*, Bowerbank. List Brit. Marine Invert. Fauna (Brit. Assoc.), p. 70.

1867 *Ficulina ficus*, Gray. Proc. Zool. Soc., p. 523.

1870 *Suberites ficus*, Schmidt. Spong. Atlant. Geb., p. 76.

Habitat.—Coralline Zone, Durham coast, abundant; Shetland abundant; on a pebble between tide-marks, Oban; Westport, Co. Mayo (N.).

42. HYMENIACIDON SULPHUREUS (*Bean*), II, 208; III, Pl. XXXVII, figs. 1—3.

1867 *Suberites sulphurea*, Gray. Proc. Zool. Soc., p. 523.

1870 *Suberites sulphurea*, Schmidt. Spong. Atlant. Geb., p. 76.

Habitat.—A small specimen encrusting the shell of *Turritella terebra*, dredged at Roundstone Bay, Galway. This sponge retains its sulphur-yellow colour a long time after preservation, though it, like almost all

colours in sponge, gradually fades out and leaves the sponge white (N.).

"On the 29th June, 1875, Mr. Hillier, of Ramsgate, sent me a specimen of *Filustra chartacea* from Pegwell Bay, the lower part of the stems of which were thinly coated by *H. sulphureus* for rather more than half an inch in height" (J. S. B.).

43. *HYMENIACIDON CELATUS* (*Grant*), II, 212; III, Pl. XXXVIII, figs. 5, 6.

1867 *Cliona celata*, Gray. Proc. Zool. Soc., p. 525.

1870 *Vicia celata*, Schmidt. Spong. Atlant. Geb., p. 76.

44. *HYMENIACIDON CLAVIGER*, *Bow.*, II, 211; III, Pl. XXXVII, figs. 20—22.

1867 *Suberites clavigera*, Gray. Proc. Zool. Soc., p. 523.

45. *HYMENIACIDON TENEBROSUS*, *Bow.*, n. sp., IV, Plate XV, figs. 1—5.

"Sponge coating, thin. Surface even, smooth. Oscula and pores inconspicuous. Dermal membrane abundantly spiculous; spicula dispersed, ovo-spinulate, long, but rather shorter than those of the skeleton. Skeleton abundantly spiculous; spicula ovo-spinulate, long, and rather slender. Sarcode abundant, dense, dark amber-coloured.

"*Colour*.—In the dried state, nut-brown.

"*Habitat*.—Birterbuy Bay, Galway, Ireland; Westport Bay tide marks; Rev. A. M. Norman.

“*Examined*.—In the dried state.

“I received from my friend the Rev. A. M. Norman five specimens of this insignificant-looking sponge; two of them from Westport Bay were so embedded in the cavities of small rough and rugged fragments of portions of a basaltic rock as to be quite unfit for delineation; another broken specimen was embedded amid small fragments of *Nullipora polymorpha* from Birterbuy Bay. Some of these specimens exhibited the oscula well; they were small and simple and irregularly dispersed; none of them exceeded a line in diameter. The remaining two specimens are those represented in Plate XV, figs. 1 and 2. The one represented by Fig. 1 was dredged by Mr. Norman in Birterbuy Bay. The sponge is on the margin of a fragment of an old bivalve shell which on its other side has several small specimens of *Isodictya MacAndrewii*. The specimen represented by Fig. 2 was presented by Mr. Robertson to Mr. Norman, to whom he stated that it was collected by the late Dr. Scouler, but from what locality was unknown. This specimen also is on a fragment of an old shell. It is exceedingly like the type represented by Fig. 1 both in its external and anatomical structures; several oscula in a closed condition are apparent on this specimen by the aid of a lens of two inches' focus.

“Each of the figured specimens consists of a small dull-brown patch of an irregular form about three-fourths of an inch in diameter, and not exceeding an eighth of an inch in thickness. Its anatomical structure is exceedingly simple. Its spicula are all of nearly the same size and form, but varying to a slight extent in their diameter; and if it were not for their unusual

ovo-spinulate form its discrimination would have been somewhat difficult. The basal terminations of all the fully developed spicula are all purely ovoid, the smallest end being the distal portion ; and this unusual form of the basal mass prevails equally in the spicula of the dermal membrane and in those of the skeleton tissues. The shafts of the spicula are rather long, and rarely exhibit even the slightest tendency to fusiformity.

“There is no known British sponge with which this species is likely to be confounded.”

46. HYMENIACIDON SUBCLAVATUS, *Bow.*, II, 209 ; III, Pl. XXXVII, figs. 9—13.

1870 *Esperia subclavata*, Schmidt. Spong. Atlant. Geb., p. 76.

47. HYMENIACIDON PAUPERTAS, *Bow.*, II, 223 ; III, Pl. XXXVII, figs 4—8.

1870 *Desmacidon paupertas*, Schmidt. Spong. Atlant. Geb., p. 76.

48. HYMENIACIDON DUJARDINII (*Johnston*), II, 224 ; III, Pl. XXXVIII, figs. 1—4.

1867 *Halisarca Dujardinii*, Gray. Proc. Zool. Soc., p. 520.

Habitat.—On *Pecten opercularis* and *Anomia ephippium* in the Minch, 1866 (N.).

Genus 20.—BATTERSBYIA, Bow., III, 347.

BATTERSBYIA BUCKLANDI, Bow.

- 1861 *Halina Bucklandi*, Bow. List Brit. Marine Invert. Fauna (Brit. Assoc.), p. 70.
 1866 *Hymeniacion Bucklandi*, Bow. II, 226; III, pl. xxxviii, figs. 9—12.
 1867 *Dercitus Bucklandi*, Gray. Proc. Zool. Soc., p. 542.
 1870 *Pachastrella Bucklandi*, Schmidt. Spong. Atlant. Geb., p. 76.
 1871 *Dercitus niger*, Carter. Ann. Nat. Hist., ser. 4, vol. vii, p. 13, pl. iv, figs. 1—6.
 1874 *Battersbyia Bucklandi*, Bow. III, 346, pl. xcii, fig. 8.

Habitat.—"I have received specimens from the Rev. A. M. Norman found between tide-marks, Westport Bay. They were small and comparatively thin, neither so large nor so massive as the type, but anatomically quite in accordance with it."—Buddleigh-Salterton, Devon, H. J. Carter, l. c.

I much regret that the name of the genus instituted by Dr. Bowerbank to receive this species and at the same time to commemorate my friend Dr. Battersby's zeal in natural history cannot be retained. Undoubtedly Schmidt's genus *Pachastrella*, established in 1868,* is the same; but Schmidt's name will also have to give place to that of Dr. Gray, which is a year earlier, and the sponge must be known as *Dercitus Bucklandi*.

The genus is altogether in a wrong place as here arranged. It has truer affinity with *Tethya*, *Ecionemia*, &c.

The following are the other known species, which

* Schmidt, 'Die Spongien der Küste von Algier,' 1868, p. 15.

will have to fall into this genus. They have all been described as *Pachastrellæ*.

Dercitus monilifer (Schmidt), Coast of Algiers.*

- *exostoticus* (Schmidt), Red Sea.*
- *abyssi* (Schmidt), Florida, 228 fath.†
- *connectens* (Schmidt), Florida, 7½ fath.†
- *amygdaloides* (Carter).‡
- *geodioides* (Carter).
- *intextus* (Carter).
- *parasiticus* (Carter).

Dercitus niger was described by Carter before the third volume was published, and having nothing to guide him but Bowerbank's description it appeared to him to differ from *Dercitus Bucklandi*, with which, however, it now seems to me quite clear that it is identical. I am at a loss to understand how it is that Carter, having clearly shown in 1871 that Gray's genus *Dercitus* had priority over *Pachastrella* of Schmidt, with which he synonymised it, and then adopted that name, should in his most recent paper have rejected *Dercitus*, and adopted *Pachastrella*. While we fully allow that it is to be regretted that the name given by Schmidt, who had honestly and laboriously worked out a classification of the Spongizoa should have to yield to one of those genera to which Dr. Gray gave names without having done anything, more than spending a few hours of closet work in the

* Schmidt, 'Die Spongien der Küste von Algier,' 1868, p. 15.

† Schmidt, 'Grünzüge einer Spongien-Fauna des Atlantischen Gebietes,' 1870, p. 64, 65.

‡ This and the three following species, described by Carter as *Pachastrellæ*, from the "Porcupine" Dredgings, will be found, 'Ann. Nat. Hist.,' ser. 4, vol. xviii (1876), pp. 406—10.

dissection of Dr. Bowerbank's second volume, yet the laws of nomenclature necessitate that *Dercitus* must stand. At the same time, in his paper on the arrangement of Sponges, as in so many other kindred publications, Dr. Gray has shown that grasp of scientific arrangement and classification which enabled him to detect and lay hold of generic characters; and I have little doubt that before very long almost all the genera of Sponges which he instituted will be recognised and his names of necessity employed.

SUB-ORDER III, I, 193; II, 8.

Genus 21.—HALICHONDRIA, *Fleming*, I, 195; II, 9.

1. HALICHONDRIA MACINTOSHII, *Bow.*, III, 340, Pl. XCI, figs. 18, 19.

1874 *Halichondria MacIntoshii*, Bowerbank. In M'Intosh on the Invertebrate Marine Fauna and Fishes of St. Andrews, Ann. Nat. Hist., ser. 4, vol. xiii, 1874, p. 144; and also the Marine Invertebrates and Fishes of St. Andrews, 1875, p. 15.

2. HALICHONDRIA REGULARIS, *Bow.*, III, 202, Pl. LXXIII, figs. 10, 11.

3. HALICHONDRIA CADUCA, *Bow.*, II, 234; III, 101, Pl. XLI, figs. 9—11.

1870 *Amorphina caduca*, Schmidt. Spong. Atlant. Geb., p. 77.

4. *HALICHONDRIA INCONSPICUA*, *Bow.*, II, 236; III, Pl. XLI, figs. 12—14.

1870 *Amorphina inconspicua*, Schmidt. Spong. Atlant. Geb., p. 77.

5. *HALICHONDRIA INCERTA*, *Bow.*, II, 237; III, Pl. XLI, figs. 15—17.

6. *HALICHONDRIA COALITA* (*Grant*), II, 238; III, Pl. XLI, figs. 18—20.

1870 *Amorphina coalita*, Schmidt. Spong. Atlant. Geb., p. 77.

Habitat.—A specimen in my cabinet was given me by Dr. Jeffreys, who dredged it in the Roach River (N).

7. *HALICHONDRIA MUTULUS*, *Bow.*, III, 209, Pl. LXXIV, figs. 4—8.

1868 *Halichondria mutulus*, Bowerbank. Last Report, Dredging Shetland Isles; Norman on Porifera, Brit. Assoc. Rep., p. 332.

8. *HALICHONDRIA CYLINDRACEA*, *Bow.*, n. sp. Pl. VI, figs. 4—8.

“Sponge massive, sessile, or coating thickly. Surface smooth, uneven. Oscula simple, minute. Pores inconspicuous. Dermal membrane pellucid, abundantly spiculous; spicula subcylindrical acerate, equable in length, but variable in diameter, dispersed; retentive spicula bidentate, equi-anchorate, rather large, few in number; and rarely bihamate, small and very

slender. Skeleton diffuse and cavernous; rete irregular, rarely more than bispiculous; spicula subcylindrical, acerate, shorter, and comparatively stouter than those of the dermis.

“*Colour*.—In the dried state, dull brown.

“*Habitat*.—Durham coast, 20 to 35 fathoms; Rev. A. M. Norman.

“*Examined*.—In the dried state.

“This sponge occurs on the carapace of an aged specimen of a female *Inachus Dorsetensis*, on which, intermixed with the sponge, there are small specimens of a *Balanus*; the surface, therefore, although smooth, is very uneven. The oscula are minute and few in number, and it required a lens of two inches' focus to perceive them. The dermal membrane is abundantly spiculous, and the spicula are dispersed without the slightest approximation to order. They require the application of a power of about 300 to render their peculiarities of form distinct to the eye. They vary to a considerable extent in diameter, although in length they are nearly equal. The bidentate, equi-anchorate, retentive spicula are very few in number, but when present they are readily seen with a power of about 100 linear; the largest I measured was $\frac{1}{8}\frac{1}{6}$ inch in length, and the smallest $\frac{1}{8}\frac{1}{70}$ inch. The biharmate spicula are of rather rare occurrence; they are smaller than the anchorate ones, and very slender, so that it is difficult to detect them *in situ* amid the sarcode with a less power than about 400 linear. Their average length is $\frac{1}{10}\frac{1}{74}$ inch. The structure of the skeleton is diffuse and cavernous, and the rete is irregular and rarely more than bispiculous. The terminations of the fully developed skeleton spicula are a

mean between those of a purely acerate and a purely cylindrical type of spiculum ; they terminate abruptly in a blunt point, but are never truly hemispherical, as in a typical form of a cylindrical spiculum. This intermediate form of the terminations of the spicula obtains in those of the dermis as well as of the skeleton, but it is not so striking in the former as in the latter, in consequence of their greater comparative tenuity. There is no other nearly allied British sponge that can be mistaken for this species."

9. HALICHONDRIA PANICEA (*Pallas*), II, 229 ; III, 97,
Plates XXXIX and XL.

1870 *Amorphina panicea*, Schmidt. Spong. Atlant. Geb.,
p. 77.

The largest example I have seen of this sponge is one which was in the collection of the late Mr. Barlee which he bequeathed to me. It is wrapped round the stem of a *Laminaria* to a length of fourteen inches, and the rounded mass has a diameter of three inches. In the comparatively thin encrusting state in which it commonly spreads itself over rocks I have sometimes seen patches extending over two or three square feet.

A "histodermal form of *Halichondria panicea*" is stated by Carter to have been dredged by the "Porcupine" Expedition (1870, station 20), in 292 fathoms ('Ann. Nat. Hist.,' ser. 4, vol. xviii, p. 407), which is a depth at which we should certainly not have expected to meet with this littoral species.

Among Dr. Bowerbank's notes is the following, which refers to examples of the species taken at as

great a depth as I remember myself to have found it. "*Halichondria panicea* from the Rev. A. M. Norman, parasitical on small branching zoophytes from the Durham coast in 20—35 fathoms; remarkable for being of a milk-white colour; the organic structures all as usual."

10. HALICHONDRIA GLABRA, *Bow.*, II, 232; III, 101, 353, Pl. XLI, figs. 1—3.

1870 *Amorphina glabra*, Schmidt. Spong. Atlant. Geb., p. 77.

11. HALICHONDRIA ANGULATA, *Bow.*, II, 233; III, Pl. XLI, figs. 4—8.

1867 *Orina angulata*, Gray. Proc. Zool. Soc., p. 540.

12. HALICHONDRIA DISTORTA, *Bow.*, II, 240; III, Pl. XLII.

1870 *Amorphina distorta*, Schmidt. Spong. Atlant. Geb., p. 77.

13. HALICHONDRIA EDUSA, *Bow.*, III, 201; Pl. LXXIII, figs. 6—9.

14. HALICHONDRIA AMBIGUA, *Bow.*, III, 213; Pl. LXXIV, figs. 14, 15.

15. HALICHONDRIA COUCHII, *Bow.*, III, 203; Pl. LXXIII, figs. 12—15.

16. *HALICHONDRIA ROBERTSONI*, *Bow.*, n. sp., IV, Plate V,
figs. 8—14.

“Sponge massive, sessile. Surface smooth and even. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane profusely spiculous; spicula fasciculated; fasciculi broad and flat, irregularly disposed. Spicula cylindrical, smooth, more or less hastate, or terminating acutely. Retentive spicula tridentate, equi-anchorate, small, but stoutly proportioned, dentes expanded; and also bihamate, minute, and slender; both forms few in number. Skeleton symmetrical, rete bi- or trispiculous; spicula acuminate, short and stout; basally and apically spinous, spines few in number. Interstitial membranes spiculous, tension spicula long and very slender, cylindrical, few in number; retentive spicula same as those of the dermal membrane, few.

“*Colour*.—In the dried state, nut brown.

“*Habitat*.—Unknown.

“*Examined*.—In the dried state.

“The specimen in course of description was given by the late Dr. Scouler to Mr. D. Robertson, and by him to my friend the Rev. A. M. Norman, by whom it was sent to me for examination and description. The late Dr. Scouler, I am aware, was a collector of the sponges of the Irish seas, and therefore I have no doubt of its being a British species, although its locality is unknown.

“The sponge has apparently been seated on a solid mass of rock, from which it has been removed by a sharp instrument, and no portion of the basal membrane remains on it. In its present condition its form

is that of half of a short, stout, pear-shaped mass. The surface is even and smooth, and the oscula are small and rather few in number. The dermal structures afford the most efficient specific characters for the discrimination of the species. The fasciculi of the tension spicula are extremely abundant; they are composed of numerous spicula closely packed in parallel lines, forming wide, flat groups, crossing each other in every possible direction. The spicula of which they are composed are equable in size, but variable to some extent in form; those in the fullest state of development have decidedly hastate terminations, while others present no terminal dilatation, but terminate suddenly and acutely instead of hemispherically. The tridentate, equi-anchorate, retentive spicula, although few in number, are very characteristic; they are small, not exceeding $\frac{1}{750}$ inch in length, and require a power of about 400 linear to render them distinct to the eye; the teeth of the spiculum are comparatively large and long, each pair nearly the length of half that of the shaft, so that their apices nearly meet each other, and they are so widely expanded that each end nearly represents a semicircle. This description more especially applies to the greatest number of these spicula, the shortest of them. The longest have a greater space intervening between the teeth of the two ends of the spiculum. One of the longest measured $\frac{1}{750}$ inch in length, and one of the shortest sort measured $\frac{1}{857}$ inch in length. The bihamate, retentive spicula are not so numerous as the bidentate, equi-anchorate ones; they are small and of very slender structure, and are not especially characteristic. One of the largest measured $\frac{1}{600}$ inch in length, and one of the smaller,

which are the most numerous, measured $\frac{1}{1000}$ inch in length.

"The rete of the skeleton structure is tolerably symmetrical, and is generally composed of three or four spicula fasciculated together; the spicula are short and stout; their spination is not very strongly produced, and it is usually confined to the base and apex of the spiculum, but occasionally a few spines are developed between the two terminations. The interstitial membranes are very sparingly supplied with tension spicula, which are so slender as to readily escape observation, and a few retentive spicula, the same as those of the dermal membrane, are occasionally observed.

"The great abundance of the hastate dermal spicula and their peculiar mode of disposition, combined with the singular forms of the tridentate, equi-anchorate, retentive ones, readily distinguish this species from several other closely allied British species."

17. *HALICHONDRIA CONDENSEA*, *Bow.*, n. sp., IV, Plate VI, figs. 1—3.

"Sponge sessile, rising, and branching irregularly, compressed. Surface smooth and even. Oscula simple, marginal, tuberculate. Pores inconspicuous. Dermal membrane reticulated, rete monospiculous. Areas mostly triangular, rarely quadrangular, one spiculum in width; spicula acerate, short and stout, same as those of the skeleton. Skeleton very much condensed and complicated; rete multispiculous, loosely fascicu-

lated; spicula acerate, short and stout. Interstitial membranes aspiculous.

“*Colour*.—In the dried state, dull ochreous yellow.

“*Habitat*.—Isle of Man; Mr. D. Robertson.

“*Examined*.—In the dried state.

“This sponge was presented to my friend the Rev. A. M. Norman by Mr. D. Robertson, and was sent to me for examination. It is an irregularly branching, compressed mass, four inches in height and about half an inch in width, the oscula on low tubercles being disposed on the margins of the mass. The dermal membrane, mounted in Canada balsam, and viewed with a power of 100 linear, is a very characteristic object; the rete is monospiculous, and never appears to exceed the length of one spiculum wide, and the areas very rarely assume any other form than that of a triangle; occasionally a quadrangular one may be observed, but this is the exception and not the rule. The mode of the disposition of the triangular areas is very irregular, but very characteristic of the species. The peculiar structure of the skeleton is very remarkable. The rete is very close and complicated; it is composed of numerous multispiculous fasciculi of short acerate spicula, so closely and densely packed together as to render the regular reticulated structure of the skeleton in some parts very indistinctly, and amid this mass interstitial cavities are irregularly distributed.

“The intermarginal cavities in this sponge are very distinctly and beautifully developed, and are very interesting objects in a slice of the sponge at right angles to the dermal surface when mounted in Canada balsam, with their beautiful canopy of reticulated dermal tissue.

“The singularity of the skeleton-structures and the beautiful dermal rete of this species renders its discrimination by no means a difficult task.”

18. *HALICHONDRIA CORALLOIDES*, *Bow.*, n. sp., IV, Plate VII, figs. 1—3.

“Sponge ramous dichotomously, surface slightly rugose. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane abundantly spiculous, reticulated; rete more or less fasciculated, fasciculi irregularly disposed; areas small, very irregular in form; spicula acerate, long, more or less variable in diameter, same form and size as those of the skeleton. Skeleton—rete irregular, diffused; interstitial and intermarginal cavities very large; spicula acerate, long and rather stout.

“*Colour*.—In the dried state, light fawn-yellow.

“*Habitat*.—Frith of Forth; Mr. D. Robertson.

“*Examined*.—In the dried state.

“I received this sponge from my friend the Rev. A. M. Norman, to whom it was presented by Mr. D. Robertson. Its external appearance in the dried state is very like that of a small branching coral or a *Gorgonia*. The surfaces of the branches are all more or less rugose or papulous; they are all cylindrical, gradually attenuating to their distal terminations. There are a few comparatively large oscula rather exceeding a line in diameter, but by far the greater number of them are minute; they are irregularly dispersed on all parts of the branches, and are rather numerous. The

dermal membrane is very characteristic of the species. It is thin and pellucid, and is furnished profusely with long, stout, acerate spicula, which are mostly collected into fasciculi containing from two or three to occasionally four or five spicula. These fasciculi are irregularly distributed, crossing each other in every direction, and thus producing numerous small irregularly shaped areas, none of which exceed the width of about one-third or one-fourth of the length of a spiculum. This mode of dermal reticulation is very remarkable, and it is of rare occurrence among the Spongiadæ. The skeleton structure is very irregular, and without the slightest approach to definite arrangement, and the interstitial cavities usually exceed the length of a spiculum in diameter. The intermarginal cavities are also numerous and very large.

“A fully developed skeleton-spiculum measured $\frac{1}{8}$ inch in length.”

19. HALICHONDRIA THOMPSONI, Bow., II, 243; III, Pl. XLIV, figs. 1—5.

1867 *Dendoryx Thompsoni*, Gray. Proc. Zool. Soc., p. 535.

20. HALICHONDRIA FORCEPS, Bow., II, 244; III, Pl. XLIII, figs. 7—13.

1874 *Halichondria forcipis*, Carter. Ann. Nat. Hist., ser. 4, vol. xiv, p. 17, pl. xiv, figs. 29—32, and pl. xv, figs. 37 a, b.

1876 *Halichondria forcipis*, var. *bulbosa*, Carter. Ann. Nat. Hist., ser. 4, vol. xviii, p. 312, pl. xiii, fig. 19, and pl. xv, figs. 37 a, b.

Habitat.—Dredged in the “Porcupine” Expedition

(1869, station 54) between the North of Scotland and the Farøe Islands, in 363 fathoms (*vide* Carter). Carter's variety *bulbosa* was dredged ("Porcupine," 1870, stations 24, 25) near Cape St. Vincent, on the Spanish Coast, in 292—374 fathoms. The form seems almost intermediate between *H. forceps* and *Desmacidon anceps*, Schmidt.* It agrees with the latter in having the legs of the forcepiform spicules short, strongly divergent and bulbous at their terminations, but in *Desmacidon anceps* only one of the ends is thus bulbous, while the anchorates are quite different, being equi- and not inequi-anchorates, and the other spicula also differ. I am inclined to think that the Spanish sponge differs specifically from *H. forceps*. Should this hereafter prove to be the case Mr. Carter's varietal name can be most appropriately retained as the specific.

21. *HALICHONDRIA SIMPLEX*, Bow., II, 246; III, Pl. XLVII, figs. 5—7.

22. *HALICHONDRIA SUBDOLA*, Bow., II, 247; III, Pl. XLIII, figs. 14—16.

23. *HALICHONDRIA FOLIATA*, Bow., III, 198; Pl. LXXIII, figs. 1—5.

1876 *Halichondria foliata*, Carter. Ann. Nat. Hist., ser. 4, vol. xviii, p. 310, pl. xiii, fig. 10, and pl. xv, figs. 29 a, b.

The "Porcupine" specimen (1869, station 65) de-

* 'Die Zweite Deutsche Nordpolarfahrt,' 1874, p. 430; 'Kiesel-spongien,' Taf 1, figs. 1—9 (the species is called *Desmacidon anceps* in the text, but *Esperia anceps* on the plate).

scribed and figured by Carter, is from a little north-west of Shetland, in 345 fathoms, and thus in deeper water though in the same region from which the type specimens were sent to Dr. Bowerbank.

24. HALICHONDRIA CORRUGATA, *Bow.*, II, 242; III, Pl. XLIII, figs. 1—6.

1867 *Biemma corrugata*, Gray. *Proc. Zool. Soc.*, p. 539.

Habitat.—Westport Bay, Mayo (N.).

25. HALICHONDRIA FALCULA, *Bow.*, III, 208, Pl. LXXIV, figs. 1—3.

1868 *Halichondria falcula*, Bowerbank. *Last Report of Dredging among the Shetland Isles; Norman on Porifera*, Brit. Assoc. Rep., p. 332.

I have found a second and much finer specimen of this species in my collection. It is from the same locality as the type, which it closely resembles in every particular, but is of larger size, measuring two and a half inches long, one and three quarters wide, and nearly an inch and a half thick.

26. HALICHONDRIA FLABELLIFERA, *Bow.*, n. sp., IV, Pl. VII, figs. 4—10.

“Sponge massive, parasitical. Surface smooth, but minutely hispid externally. Defensive spicula very numerous, scarcely projecting through the dermis, fusiformi-acuate, basally and occasionally apically spinous; spines few in number, acutely conical. Dermal membrane pellucid, abundantly spiculous;

tension spicula subfusiformi-cylindrical, long and slender, numerous, more or less fasciculated or dispersed; retentive spicula bihamate, simple and contort, numerous, variable in size; and bidentate equi-anchorate, and rarely palmato-inequi-anchorate. Oscula simple, dispersed. Pores inconspicuous. Skeleton rete irregular; spicula fusiformi-acuate, stout and moderately long. Interstitial membranes spiculous, tension spicula rarely present; retentive spicula same as those of the dermal membrane, numerous.

“*Colour*.—In the dried state, dark brown.

“*Habitat*.—Westport Bay, Ireland, 5 fathoms; Rev. A. M. Norman.

“*Examined*.—In the dried state.

“I received a single specimen of this species from my friend the Rev. A. M. Norman for examination. It completely fills the interstices of a mass nearly two inches long by one in breadth of a specimen of *Nullipora polymorpha*, and in some parts growing over the apices of the branches and presenting a smooth sponge surface to the eye. The surface is very minutely hispid in the dried state, though both to the eye and to the touch it appears to be smooth, and it is only when a section of the sponge is made at right angles to the surface and mounted in Canada balsam that the numerous external defensive spicula become visible, and even in this state very few comparatively pass through the dermal membrane. These spicula rarely exceed half the length of the skeleton ones, and they are much more slender; they are usually only basally spinous, but occasionally a few spines appear on various parts of the shaft or near the apex, but these are rarely so well developed as those of the base of the spiculum.

The dermal membrane is especially characteristic of the species. It is abundantly supplied with spicula; the tension ones are subfusiformi-cylindrical, rather long and slender; on some parts of the membrane they are dispersed indiscriminately, but most frequently they are more or less gathered into broad, flat fasciculi, many of which radiate at one extremity in a fan-shaped manner. The retentive spicula are also very numerous. The simple and contort bihamates are small, and some of them very minute; they vary in length from $\frac{1}{750}$ inch to $\frac{1}{2000}$ inch, while the length of the fully developed bidentate, anchorate spicula, average $\frac{1}{882}$ inch in length. This near approximation of the fully developed anchorate and bihamate spicula in their length is very unusual, as it is most frequently the case that the latter form is at least twice as long as the former. The bidentate equianchorate spicula are also numerous; comparatively speaking they are stout and well developed in their mature state, but in this specimen they may be seen in various early and progressive stages of development in the form of minute simple bihamate spicula, very different in their shapes from the real bihamate ones.

The skeleton is very irregular in its structure, but decidedly reticulate. The rete is also more or less irregular; in some parts it is multispiculous, while in others it is constructed of only two or three spicula. The spicula of which it is formed are very much larger than those of any other part of the sponge; they are decidedly fusiform, and occasionally subclavate at the base. The interstitial membranes are abundantly supplied with both forms of the retentive spicula, but the tension forms, so abundant on the dermal membrane,

are of very rare occurrence. A very few inequi-palmato-anchorate spicula were detected among the spicula separated by boiling in nitric acid, but I could not detect them *in situ*; they are remarkable in their form, though very minute, the palmate portion being quite half the length of the spiculum."

27. *HALICHONDRIA INCRUSTANS*, *Esper*, II, 249; III, 108, Pl. XLIV, figs. 7—12.

1867 *Dendoryx inorustans*, Gray. Proc. Zool. Soc., p. 535.

1874 *Halichondria incrustans*, Carter. Ann. Nat. Hist., ser. 4, vol. xiv, pp. 2—4.

Habitat.—Buddleigh-Salterton, Carter. Birterbuy Bay, Galway; Jersey; Guernsey; Polperro, Cornwall (N.). It is essentially a low-water-mark species, generally distributed round our coast.

28. *HALICHONDRIA CANDIDA*, *Bow.*, II, 251; III, Pl. XLIV, figs. 13—16.

1867 *Biemma candida*, Gray. Proc. Zool. Soc., p. 539.

29. *HALICHONDRIA IRREGULARIS*, *Bow.*, II, 252; III, Pl. XLIV, figs. 17—21.

1867 *Dendoryx irregularis*, Gray. Proc. Zool. Soc., p. 536.

30. *HALICHONDRIA DICKIEI*, *Bow.*, II, 253; III, Pl. XLV figs. 1—6.

1867 *Dendoryx Dickiei*, Gray. Proc. Zool. Soc., p. 536.

Habitat.—On *Cellepora cervicornis*, deep water, Shetland Seas, 1863; Polperro (N.).

31. HALICHONDRIA PATTERSONI, *Bow.*, II, 255; III, 115, 354, Pl. XLVI, figs. 1—6.

1867 *Dendoryx Pattersoni*, Gray. Proc. Zool. Soc., p. 536.

Habitat.—A single specimen dredged off Shetland. With reference to my Minch specimens which are figured in vol. iii, p. 115, it would be interesting to add that they were dredged by Dr. Jeffreys and myself at a spot off the mouth of Loch Ewe, in Ross-shire, where this sponge was living in company with some of the rarest animals in the British seas, including *Poromya granulata*, *Holothuria intestinalis*, and *Antedon celticus* (N.).

32. HALICHONDRIA PULCHELLA, *Bow.*, II, 256; III, Pl. XLVI, figs. 16—19.

1867 *Biemma pulchella*, Gray. Proc. Zool. Soc., p. 539.

32. HALICHONDRIA INGALLI, *Bow.*, II, 258; III, Pl. XLVI, figs. 20—24.

1867 *Menyllus Ingalli*, Gray. Proc. Zool. Soc., p. 533.

33. HALICHONDRIA SCANDENS, *Bow.*, II, 259; III, Pl. XLV, figs. 14—20.

1867 *Iophon scandens*, Gray. Proc. Zool. Soc., p. 534.

34. HALICHONDRIA BATEI, *Bow.*, II, 261; III, Pl. XLVI, figs. 25—29.

1867 *Dendoryx Batei*, Gray. Proc. Zool. Soc., p. 536.

35. *HALICHONDRIA NIGRICANS*, *Bow.*, II, 266; III, Pl. XLV, figs. 25—31.

1867 *Iophon nigricans*, Gray. Proc. Zool. Soc., p. 534.

36. *HALICHONDRIA ALBULA*, *Bow.*, II, 268; III, Pl. XLV, figs. 21—24.

1867 *Dendoryx albula*, Gray. Proc. Zool. Soc., p. 536.

37. *HALICHONDRIA EXPANSA*, *Bow.*, III, 212, Pl. LXXIV, figs. 7—12.

1869 *Halichondria expansa*, Bowerbank. Norman, Notes on a few Hebridean Sponges, Ann. Nat. Hist., ser. 4, vol. iii, p. 298.

38. *HALICHONDRIA VIRGEA*, *Bow.*, n. sp., IV, Pl. V, figs. 1—7.

1875 *Halichondria virgea*, Bowerbank. Report Dredging off the Durham and N. Yorkshire Coasts, Brit. Assoc. Rep., 1875 (1876), p. 198.

“Sponge massive, sessile, more or less nodulous. Surface smooth. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane abundantly spiculous, tension spicula acuate, very long and slender, numerous, fasciculated; retentive spicula bidentate, equi-anchorate, large, few in number, and the same form, small and numerous. Skeleton—rete more or less regular, fibres rarely multispiculous, seldom more than trispiculous; areas large; spicula subfusiformi acuate, basally spinous. Interstitial membranes spiculous; spicula same as those of the dermis; tension spicula of rare occurrence; retentive spicula rather numerous.

“*Colour*.—In the dried state, dark purple.

“*Habitat*.—Coast of Durham, 20 to 35 fathoms ;
Rev. A. M. Norman.

“*Examined*.—In the dried state.

“I received four small specimens of this sponge from the Rev. A. M. Norman for examination. The largest was two inches in length, one inch broad, and not quite half an inch in thickness. The largest specimen was composed of four unequal-sized nodulous elevations, and there were indications of a similar character on the smaller ones. The dermal membrane affords the most efficient characters for the discrimination of the species, the tension spicula and their mode of distribution more especially so. In some few parts the slender, acuate spicula are somewhat irregularly dispersed, but by far the greater number of them are arranged in elongated fasciculi, which most frequently run parallel to each other, and from each of which the component spicula are frequently projected at slight angles from the central axis in an ascending direction. These bundles are in many parts so numerous and so close together as to almost appear as if the spicula were felted together. The retentive spicula are also very numerous, especially the smaller of the two descriptions of them. The larger forms are comparatively few in number, and are readily distinguished from the smaller series; they are all of the same size as nearly as possible. Several of them measured $\frac{1}{3}\frac{1}{15}$ inch in length, while the average size of the smaller ones was $\frac{1}{8}\frac{1}{17}$ inch in length, and no gradational intermediate forms could be seen connecting the two groups. Both forms when *in situ* were attached to the surface of the membrane by the middle of their curved shafts, so that

the anchorate terminations were both projected from the surface of the membrane.

“The skeleton rete is rather unequal in its structure; it usually consists of two or three spicula in substance, but sometimes the number of spicula is more than can be distinctly determined; they are somewhat unequal in length, but in the adult forms they all agree in the slightly spinous character of their bases; occasionally, but rarely, a few spines may be detected near their apices, but this is rather the exception than the rule. The spination of these spicula requires a power of not less than 300 linear to render it distinct to the eye. The tension spicula are rarely to be seen on the interstitial membranes, but on many parts of them the anchorate retentive spicula are abundantly distributed.

“The nearest ally among our British species of sponges to the one in course of description is *Halicondria Dickiei*, but they are readily discriminated by the difference in the forms of their retentive spicula, and also in their mode of distribution on the dermal membrane.”

39. *HALICHONDRIA GRANULATA*, *Bow.*, II, 262; III, Pl. XLV, figs. 7—13.

1867 *Dendoryx granulata*, Gray. Proc. Zool. Soc., p. 536.

40. *HALICHONDRIA FABINARIA*, *Bow.*, II, 269; III, Pl. LXX, figs. 5—8.

41. *HALICHONDRIA INORNATA*, *Bow.*, II, 271; III, Pl. XLVII, figs. 1—4.

1867 *Biemma inornata*, Gray. Proc. Zool. Soc., p. 539.

Genus 22.—ISODICTYA, *Bow.*, I, 197; II, 9.

1. ISODICTYA CINEREA (*Grant*), II, 274; III, 121; Pl. XLVIII, figs. 1—5.

Habitat.—Apparently universally distributed round our coasts. In addition to the many localities recorded in Volumes II and III, I have found it at Guernsey; Seaham Harbour, in the County of Durham; on *Nullipora*, Roundstone and Birterbuy Bays, Co. Galway; and Westport Bay, Co. Mayo (N.).

For “Chudleigh Salterton,” vol. ii, p. 275, line 4, read “Budleigh-Salterton,” and p. 276, line 27, for “Seahouse” read “Seaham.”

2. ISODICTYA PERMOLLIS, *Bow.*, II, 278; III, 123; Pl. XLVIII, figs. 9, 10.

3. ISODICTYA MAMMEATA, *Bow.*, II, 306; III, Pl. LI, figs. 7—9.

4. ISODICTYA RAMUSCULUS, *Bow.*, II, 314; III, Pl. LIII, figs. 1—3.

Habitat.—Several small pieces, of which the largest is three quarters of an inch long, half an inch wide, and as much thick, and has five oscula surmounting nipple-like swellings, found between tide marks, Innisgowla, Westport Bay, Co. Mayo. Colour when alive, pale violet. It is an erect growing species (N.).

5. *ISODICTYA FERULA*, Bow., n. sp., IV, Pl. VIII, figs. 1—3.

“Sponge battledore-shaped, coating, adhering throughout its whole length. Surface smooth. Oscula dispersed, simple, minute. Pores inconspicuous. Dermal membrane pellucid, aspiculous. Skeleton having primary and secondary lines unispiculous; spicula acerate. Interstitial spaces one spiculum wide, very regular. Interstitial membrane aspiculous.

“*Colour*.—In the dried state, dull ochreous yellow.

“*Habitat*.—Birterbuy Bay, Ireland, 10 or 11 fathoms; Rev. A. M. Norman.

“*Examined*.—In the dried state.

“Among the specimens of sponges dredged by the Rev. A. M. Norman off the western coast of Ireland, there was the gibbous half of a shell of *Pecten maximus*, thinly coated both within and without with *Raphyrus Griffithsii*, and on the surface of this species, on the inner surface of the shell, were several parasitical sponges, and among them two specimens of the species in course of description within an inch of each other, closely adhering for the whole of their length. They were partially embedded in a thin broad specimen of *Isodictya Bowerbanki*.

“The oval body of the largest specimen is six lines in length and three in breadth, and its greatest thickness does not exceed one line. The caudal appendage is seven lines in length and one in breadth, so that the total length slightly exceeds one inch. The smallest of the two specimens has the body rather more obtusely oval than the larger one, the length being four lines and the greatest breadth three lines. A portion of the caudal appendage has been lost, and half only of

its length remaining attached to the body of the sponge. In both specimens the caudal portion of the sponge maintains the same diameter for the whole of its length, so that the specimens closely resemble each other, each having the form of a rudely-shaped child's battledore.

" This remarkable form is not without a precedent, as it occurs in *Polymastia radiosa* represented in Plate XI, figs. 14 and 15, vol. iii, 'Mon. Brit. Spongiadæ;' and, what is very remarkable, there is about the same amount of individual variation in the two specimens of each species of sponge, so that if the figures representing *P. radiosa* were enlarged to the size of the two specimens of *Isodictya ferula*, they would form very good representations of the shapes of those of *I. ferula*, so as to be very apt to produce a belief in the mind of a hasty observer that the latter-named sponges were enlarged specimens of *P. radiosa*, or *vice versâ*; but accurate examinations of the structural characters of the two species at once distinguishes them as not only separate species, but also as belonging to different genera; and in addition to the generic differences, the spicula of the skeleton of *P. radiosa* are acuate, while those of *I. ferula* are acerate.

" The anatomical structures of *I. ferula* are exceedingly simple, but beautifully regular. The scalariform skeleton tissues are composed throughout the whole structure of a unispiculous network of acerate spicula, and it is only very rarely that two spicula occur together in any part of the primary lines of the skeleton. The secondary lines of the skeleton are each composed of a single spiculum, and they are disposed at such regular distances from each other as to cause the

skeleton tissues in a section of the sponge taken correctly at right angles to its surface and mounted in Canada balsam to present the appearance of a beautifully regular unispiculous quadrangular network.

"The dermal membrane is translucent, and in the areas of the terminations of the skeleton structures there were a few pores in an open condition. One form and size only of spicula occurs in this sponge, the purely acerate one."

6. *ISODICTYA ROSEA*, *Bow.*, II, 282; III, Pl. XLIX, figs. 12—14.

7. *ISODICTYA PYGMÆA*, *Bow.*, II, 313; III, Pl. LVI, figs. 6—10.

1861 *Haliclona pygmæa*, Bowerbank. List Brit. Marine Invert. Fauna (Brit. Assoc.), p. 71.

Habitat.—Sides of rock-pools between tide-marks to the south of Seaham Harbour, Co. Durham. The specimens in all respects closely agreeing with those which occur at Scarborough. The species, as far as is yet known, is confined to the East Coast of England (N.).

8. *ISODICTYA OBSCURA*, *Bow.*, III, 224 and 303, Pl. LXXVI, figs. 1, 2; Pl. LXXXVII, fig. 11.

9. *ISODICTYA INDEFINITA*, *Bow.*, II, 286; III, Pl. XLIX, figs. 15—17.

10. ISODICTYA INDISTINCTA, *Bow.*, II, 290; III, 131 and 356, Pl. LI, figs 1—4.

Habitat.—Dredged in about five fathoms near the mouth of Westport Bay. Among Dr. Bowerbank's notes are the following on two of the examples procured by me from this locality (N.).

"A fine mass of this sponge, about the size of half a large-sized orange, based on a rolled stone. In form and general surface characters it differs very considerably from either of the types figured in Plate LI, vol. iii, 'Mon. Brit. Spongiadæ.' The mass was soft and flesh-like and the oscula were large simple orifices. In the peculiarities of its dermal structures, and in all of its anatomical details, it is quite in accordance with those of the type-specimens, and, like them, it strongly illustrates the inutility of external characters as specific distinctions. Numerous specimens of *Porcellana longicornis* were nestling within its large internal cavities. Another specimen in Mr. Norman's collection from the same locality is an irregular mass of a very dark dull purple or brown colour, it was two and a half inches in length, one and three quarters inch in breadth and thickness. It is noteworthy as being the largest specimen of the species that I have yet seen."

11. ISODICTYA SIMPLEX, *Bow.*, II, 294; III, 107, 128, Pl. XLIV, fig 6, and Pl. L, fig. 18.

12. ISODICTYA POCILLUM, *Bow.*, II, 305; III, Pl. LIII, figs. 4—6.

13. *ISODICTYA LUTEOSA*, *Bow.*, III, 288; Pl. LXXXV, figs. 5—7.

14. *ISODICTYA ANOMALA*, *Bow.*, II, 293; III, Pl. L, figs. 1—4.

1868 *Ficulina anomala*, Parfitt. Trans. Devon. Assoc. Sci. Liter. and Art, p. 13 (in separate copy).

15. *ISODICTYA PARASITICA*, *Bow.*, II, 287; III, Pl. XLIX, figs. 6—8.

16. *ISODICTYA PEACHII*, *Bow.*, II, 276; III, Pl. XLVIII, figs. 6—8.

Habitat.—Magnificently large examples dredged in company with the large specimens of *Isodictya indistincta* just described, *Raphiodesma floreum*, *Ophlitaspongia seriata* (unusually fine), *Dysidea coriacea*, and many other sponges a little inside the Lighthouse of Westport Bay, Co. Mayo. Among Dr. Bowerbank's notes are the following on these specimens, which were submitted by the editor to him:

"This sponge is very different in size and form from the type-specimen of the species, but it agrees so perfectly with it in its organic structures that it cannot possibly be referred to any other species of *Isodictya*, nor established as a distinct species. The specimen sent to me for examination by the Rev. A. M. Norman was dredged at Westport Bay, Co. Mayo, Ireland, in from five to six fathoms. It was four and a quarter inches in length, two and a half

inches broad, and one and a half inch thick, with ten large, elevated, oscular orifices, the largest nearly a quarter of an inch in diameter. On the paper accompanying the specimen the colour is stated to be 'lilac,' and Mr. Norman adds, 'I have a specimen, not so fine as regards oscula, &c., but twice the size of this.' I am not surprised in so large a specimen at the congregation of the oscula in large cloacal organs. This frequently occurs in other largely-developed species of sponge, which in a younger state have the oscula simple and dispersed on the dermal surface. In *Halichondria panicea* these differences are of frequent occurrence."

17. ISODICTYA VARIANS, *Bow.*, II, 281 ; III, 307, Pl. XLVIII, figs. 14—16, Pl. LXXXVIII.

1867 *Philotia varians*, Gray. Proc. Zool. Soc., p. 522.

18. ISODICTYA ELEGANS, *Bow.*, II, 283 ; III, Pl. XLIX, figs. 1—5.

Habitat.—Under stones between tide-marks, Westport, Roundstone, and Birterbuy Bays ; also dredged in these same bays growing on shells and Nullipora (N.).

19. ISODICTYA FALLAX, *Bow.*, II, 302 ; III, Pl. LI, figs. 10—13.

20. *ISODICTYA* *MACANDREWII*, *Bow.*, II, 284; III, Pl. XLIX, figs. 9—11.

Habitat.—Abundant on *Pecten maximus*, *Lutraria*, and other dead shells dredged in Birterbuy Bay; also in Roundstone Bay, and Westport, Co. Mayo (N.).

“Among the numerous specimens of British sponges sent to me for examination by the Rev. A. M. Norman I found among those dredged in Westport and Roundstone Bays more than a dozen specimens of *I. MacAndrewi*. The largest of them rather exceeded the size of the type-specimen described in vol. ii, p. 284, ‘Mon. Brit. Spongiadæ.’ Their external characters were also in accordance with those of the type-specimen. I did not detect gemmules in any of them, but their anatomical characters were identical with those of the described specimen. Along with them I also found a specimen of *Isodictya fistulosa*, which in some cases might be readily confounded with *I. MacAndrewi*. The size of the spicula and their mode of arrangement in the skeleton and dermal membrane very closely resembles those of *I. MacAndrewi*, but they are readily to be distinguished, by close observation, when sections of the two species are mounted in Canada balsam, by the aid of a power of about 200 linear, by the numerous external spicula projected from the dermal membrane of *I. MacAndrewi*, and the total absence of those organs on the dermis of *I. fistulosa*.”

21. ISODICTYA FISTULOSA, *Bow.*, II, 299; III, 136, Pl. LIII, figs. 15—17.

Habitat.—A small sponge named by Bowerbank as belonging to this species is referred to in his note on *Isodictya MacAndrewi*. It was procured by me in 1875 in Birterbuy Bay (N.).

22. ISODICTYA DICHOTOMA, *Bow.*, II, 309; III, Pl. LIII, figs. 12—14.

23. ISODICTYA PERPLEXA, *Bow.*, n. sp., IV, Pl. IX, figs. 4—6.

“Sponge massive, parasitical. Surface smooth and even. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane reticulate; rete irregular, rarely exceeding trispiculous, spicula variable in size, fusiformi-acerate, mostly large, same size as those of the skeleton; tension spicula acerate, long and slender, numerous, dispersed. Skeleton with primary lines bi- or trispiculous, irregularly disposed; secondary lines mostly unispiculous, abundant and very irregularly disposed; spicula fusiformi-acerate, large and long. Interstitial membranes abundantly spiculous; tension spicula acerate, long and slender, same as those of the dermis.

“*Colour.*—In the dried state, dark brown with a tint of purple.

“*Habitat.*—Westport Bay, Ireland, in 5—6 fathoms; Rev. A. M. Norman.

“*Examined.*—In the dried state.

“The colour and external appearance of this sponge, and the similarity of its location among the branches of *Nullipora polymorpha*, would readily lead a hasty observer to the conclusion that the type-specimen of *Halichondria flabellifera* and this one in course of description were the same species; but a very slight microscopical examination quickly dissipates the illusion. But there is yet another difficulty to be surmounted before we arrive at a correct determination of the genus and species. The structural peculiarities of this sponge are so wide and diffuse, and the abundance throughout the whole of its structure of the long and slender tension spicula, as to very readily lead to the belief that the skeleton structure is that of a *Hymeniacidon*, and it is only by the careful examination of a correctly cut section at right angles to the dermal surface, and with a power of about 200 linear, that we become satisfied of its isodictyal structure. The specimens under consideration are immersed among the branches of *Nullipora polymorpha*, the largest being one and a quarter inch in length by three quarters of an inch in diameter, and in some parts it completely covers the distal terminations of the branches of the *Nullipora*.

“The dermal characters in this species are remarkable, there not only being a well-developed rete, but in addition to that in many parts an abundant supply of long, slender, acerate tension spicula; so numerous in some cases as to nearly obscure the reticulate structure beneath them.

“The dermal rete is very distinctly produced, but its mode of arrangement is very irregular, and the areas assume a great variety of forms, which are frequently

still further complicated by the intermixture of the long and slender tension spicula. The same complication of characters exists in the skeleton structures by the abundant presence of the long slender tension spicula on the interstitial membranes ; so that although but one form of spiculum, that of the fusiformi-acerate, stout and slender, prevails in this sponge, the peculiarities of their intermixture render this species a specially perplexing one for specific determination."

24. ISODICTYA DENSE, *Bow.*, II, 292 ; III, 355, Pl. L, figs. 5—7.

25. ISODICTYA GREGORII, *Bow.*, II, 301 ; III, Pl. L, figs. 15—17.

26. ISODICTYA PALLIDA, *Bow.*, II, 297 ; III, Pl. L, figs. 8—10.

Habitat.—Jersey. Tide-marks, Westport Bay (N.).

27. ISODICTYA SIMULANS (*Johnston*), II, 308 ; III, Pl. LI, figs. 5, 6.

1861 *Haliclona simulans*, *Bow.* List Brit. Marine Invert. Fauna (Brit. Assoc.), p. 71.

1867 *Adocia simulans*, *Gray.* Proc. Zool. Soc., p. 522.

Habitat.—"Aberystwith, Mr. Bolton," purchased by me from Mr. Ingall's collection ; Guernsey ; Strangford Lough, 1869 ; Birterbuy Bay, Connemara, 1875 (N.).

28. *ISODICTYA INGALLI*, *Bow.*, III, 241, Pl. LXXXVIII, figs. 1—5.
29. *ISODICTYA INCERTA*, *Bow.*, III, 314, Pl. LXXXIX, figs. 3, 4.
30. *ISODICTYA CRASSA*, *Bow.*, n. sp., IV, Pl. VIII, figs. 4—6.

“Sponge massive, sessile; furnished with large tumulous cloacæ. Surface smooth. Oscula simple, within the cloacæ. Pores inconspicuous, dispersed within the dermal rete. Dermal membrane pellucid, furnished with a stout irregular reticulation; spicula subfusiformi-acerate, same size as those of the skeleton. Skeleton very open and diffuse, irregular; primary lines multispiculous; secondary lines varying from multispiculous to unispiculous; very irregularly disposed. Spicula subfusiformi-acerate.

“*Colour*.—In the dried state, milk-white.

“*Habitat*.—Westport Bay, Island of Innisgowla, under stones; Rev. A. M. Norman.

“*Examined*.—In the dried state.

“I received three specimens of this species of sponge for examination. The largest is three inches in length, one and a quarter in breadth, and about one inch in thickness; the other two were much smaller, but all possessed the strongly developed tumulous character of their surfaces, and all three had been located on small branching fuci. The tumulous cloacæ on the largest specimen were short and stout, not exceeding about half an inch in height, and the excurrent orifices were about two lines in diameter. When a thin slice

from the dermal surface mounted in Canada balsam was submitted to microscopical examination with a power of 100 linear, the dermal reticulation presented a very beautiful appearance; although very irregular in its structure it forms a strikingly distinct specific character.

“The areas of the network are not more than about half the length of a spiculum wide, and by far the greater number of them are triangular; and the rete bounding the areas varies considerably in its structure, from being multispiculous to a single spiculum. The pores were in an open condition; they were dispersed among the areas, there being rarely more than one in each of them.

“The skeleton is very diffusely constructed and exceedingly irregular, and it is only near the dermal surface that the true Isodictyal character can be recognised with certainty. The interstitial cavities are large and numerous, thus producing a great complication of its structures. The primary lines of the skeleton vary considerably in their structure, the spicula being very numerous in some, while they are very few in others. The same structural irregularity obtains in the secondary lines of the skeleton, and the irregularity of their disposition adds to the confusion. Amidst all this structural complication the skeleton is unmistakably that of an *Isodictya*.

“There is but one form and size of the spicula in this sponge, the subfusiformi-acerate. A fully developed skeleton one measured $\frac{1}{480}$ inch in length and $\frac{1}{2000}$ inch in diameter. These dimensions are greatly in excess of those of the spicula of the greater number of species of *Isodictya* in this division of the genus.

“In the dried state this sponge very closely resembles some of the varieties of *Halichondria panicea* in form, in colour, in the shape of the spicula, and in the possession of a reticulated dermal membrane, but the examination of a thin slice of the sponge at right angles to its surface immediately destroys the illusion; as the strongly produced scalariform structure of the genus *Isodictya* in this species is totally unlike the skeleton structure of a specimen of *Halichondria panicea*.

“My friend the Rev. Mr. Norman states that this species ‘was found at Westport Bay under stones at low-water spring tides August, 1875. This sponge is very easily recognised when living. It is of a lemon-yellow colour, and runs irregularly over the stones in the form of large attached cloacal tubes, which here and there expand into outspread patches of the sponge from which arise several large upright cloacal openings. The sponge is very soft to the touch, the dermal membrane often much expanded with water, having a remarkable membranous appearance to the naked eye.’”

31. *ISODICTYA BOWERBANKI*, Norman.

ISODICTYA SIMULO, Bow., II, 279; III, Pl. XLVIII, figs. 11—13.

Habitat.—Filling the interstices of *Nullipora polymorpha*, and sometimes growing long enough to completely cover the Nullipore; dredged in Roundstone Bay, and under similar circumstances in Westport Bay (N.).

“Among the sponges I received from the Rev. A. M. Norman, dredged on the western coast of Ireland,

was a large gibbous valve of *Pecten maximus*, covered within and without with a thin coat of *Raphyrus Griffithsii*, upon which on the inner surface of the shell were several parasitical marine animals, and among them two specimens of *Isodictya ferula*, partially immersed in a thin spreading specimen of *Isodictya simulo*, agreeing both in external form and in anatomical structure with the type-specimen of that species. This is the second specimen of that sponge that I have seen."

Dr. Bowerbank having named one species of this genus *I. simulans*, and another *I. simulo*, it became necessary to rename the latter.

32. ISODICTYA FILAMENTA, *Bow.*, III, 286, Pl. LXXXV, figs. 1—4.

33. ISODICTYA PAUPERCULA, *Bow.*, n. sp., IV, Pl. X, figs. 6—8.

"Sponge coating, thin. Surface minutely rugose. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane pellucid, sparingly spiculous; spicula acerate, very slender, dispersed, few in number. Skeleton—rete slender and fragile; primary lines mostly unispiculous, occasionally bi- or rarely trispiculous; secondary lines unispiculous; spicula acerate, rather stout and long.

"Colour.—In the dried state, dull dark green.

"Habitat.—Birterbuy Bay, Ireland, in 10 fathoms; Rev. A. M. Norman.

"Examined.—In the dried state.

"This sponge covers nearly the whole of the inner

surface of a fragment of the under valve of a *Pecten varius* about two inches in diameter, and in no part does it assume a greater thickness than about a line. Its anatomical structure is exceedingly simple and in its present state very fragile. The specimen was probably dead when taken, as both the dermal membrane and the sarcodous matter are in a somewhat delapidated condition. What remains of the dermal membrane is very thin and pellucid; it is very sparingly furnished with very slender acerate spicula, which are nearly equal to those of the skeleton in length, but are rarely more than about one-fourth of their diameter. The skeleton rete is somewhat irregular but decidedly Isodictyal in character: the primary lines are rarely more than unispiculous, but occasionally for short distances they contain two or even three spicula. The secondary lines appear never to be more than unispiculous. The spicula are comparatively rather stout and long.

"The nearest ally to this species is *Isodictya Bowerbanki*. Although in their mode of structure they are very similar, the proportions of their skeleton spicula vary to so great an extent as to at once separate them as species.

"The spicula of the species under consideration measure $1\frac{1}{48}$ inch in length, while those of *I. Bowerbanki* are $\frac{1}{281}$ inch in length, and although so much shorter their diameter is greater than those of *I. pauperacula*."

34. ISODICTYA OLAVA, *Bow.*, II, 316; III, Pl. LIII, figs. 7—11.

Habitat.—Dredged off Saints Bay, Guernsey (N.).

"I received from my friend Mr. Higgin, on the 21st of September, 1874, three specimens of *Isodictya clava* from extreme low-water mark in Caernarvon Bay. They were found pendent from the under sides of large stones. These specimens differed essentially in size and form from the type ones represented. One of them was of the same form as the specimen represented by fig. 7, Plate LIII, vol. iii, but rather larger in its proportions. It was evidently the base of the sponge, there being about the eighth of an inch in length projected from its distal extremity of the same diameter as the fragment represented by fig. 9. Another specimen without the base was of the same diameter as fig. 9, but it was an inch and three quarters in length, and terminated dichotomously at its distal extremity in two short prongs. These specimens afford us a much better idea of the normal form of the species than those represented as the types of the species. Their anatomical structures were in perfect accordance with those of the type-specimens. These interesting specimens belong to the Liverpool Museum."

35. *ISODICTYA JUGOSA*, Bow., II, 296; III, Pl. L, figs. 11—14.

1867 *Gellius jugosus*, Gray. Proc. Zool. Soc., p. 538.

Habitat.—Nullipore dredged near the entrance of Westport Bay, Co. Mayo, is remarkable on account of the large number of rare sponges which grow upon it, nestling among the branches, and filling up the spaces between them. One of these sponges was returned

to me by Dr. Bowerbank labelled "*Isodictya jugosa?*" (N.).

36. *ISODICTYA PALMATA* (*Johnston*), II, 311; III, Pl. LII.

1861 *Haliclona palmata*, Bow. List Brit. Marine Invert. Fauna (Brit. Assoc.), p. 71.

Habitat.—This is one of the finest of British sponges, and very large specimens are occasionally brought up attached to the hooks of the "long lines" set by the fishermen of Holy Island, Northumberland (N.).

37. *ISODICTYA TRUNCA*, *Bow.*, n. sp., IV, Plate XI, figs. 5—10.

"Sponge massive, sessile. Surface even, smooth. Oscula simple, dispersed. Pores inconspicuous, apparently congregated in aspiculous areas. Dermal membrane abundantly spiculous; spicula irregularly dispersed, acerate, slender. Skeleton symmetrical; primary lines multispiculous, irregular in number of spicula, rarely more than one spiculum wide; secondary lines unispiculous, occasionally bi- or trispiculous; spicula subfusiformi-acerate, short, and rather stout. Interstitial membranes furnished abundantly but irregularly with slender, acerate, tension spicula, same as those of the dermal membrane. Internal defensive spicula attenuato-acuate, very minute, with more or less truncated bases, which are incipiently spinous.

"*Colour*.—In the dried state, externally, dark purple; internally, nut-brown.

“*Habitat*.—Westport Bay, Ireland, 5 fathoms ; Rev. A. M. Norman.

“*Examined*.—In the dried state.

“I received a considerable number of specimens of this sponge for examination from my friend the Rev. A. M. Norman, who informed me that they were dredged in about 5 fathoms just inside of the Lighthouse at Westport Bay, Ireland. They were of various sizes, but all of them irregularly massive in form. The largest is two and a half inches in length, one and a half inch in breadth, and three quarters of an inch in thickness ; the smallest one does not exceed half an inch in diameter. They all agree very closely in the dark purple surface colour, and their surfaces are mostly smooth ; but in the two largest the surfaces are slightly granulated. The dermal membrane is furnished with numerous, slender, acerate, tension spicula, which are rather irregularly distributed, being numerous dispersed in some parts and sparingly so in others ; and there are also irregularly shaped areas in which there are few or none of them, and in these areas a few open pores were observed. These areas are very characteristic of the species. They are just such as those observable in *Isodictya indistincta*. The primary lines of the skeleton vary to some extent in the number of the spicula composing them, but in all they are more or less multispiculous. The secondary lines of the skeleton are numerous and are rather regularly disposed, so that the general form of the skeleton-rete is, to a very considerable extent, symmetrical.

“The tension spicula of the interstitial membranes are not so numerous as they are on the dermal one.

The internal defensive spicula are especially characteristic of the species, but they are by no means easy of detection, as they are rather few in number and very small, requiring a power of not less than about 1000 linear to exhibit their forms and proportions distinctly, and when *in situ*, immersed in the sarcode, it is very rarely that they can be detected. When portions of the sponge have been boiled in nitric acid and the spicula mounted in Canada balsam, they may by careful observation be detected sparingly dispersed among the other spicula, but even then they may readily escape observation from their minuteness and from the strong resemblance they have to fragments of broken spicula. Their form is regularly attenuated from base to apex, and there are no spines upon any other part than just at the basal extremity, and there the spines are few in number and very inefficiently produced, and the square truncated form of the base gives them very much the appearance of a broken basal termination, but when examined with a sufficiently high power they are especially characteristic of the species. Their average length is $\frac{1}{481}$ inch, and their greatest diameter $\frac{1}{8000}$ inch. The degree of their basal spination also varies to some extent. The one represented by Fig. 9 is the most profusely spined one that I have seen. Fig. 10 exhibits about the average amount of spination, and occasionally one may be seen upon the base of which no spines can be detected.

"The only species that is at all liable to be confounded with *I. trunca* is *I. jugosa*, but it is readily distinguished by the total absence of retentive spicula, which are sufficiently abundant in the last-named species to at once distinguish it from the one under

description, and in *I. jugosa* there are no internal defensive spicula.

"This species appears to be rather abundant at the locality from which Mr. Norman obtained it, but I have not received specimens of it from any other place."

38. ISODICTYA INFUNDIBULIFORMIS (*Johnston*), II, 317; III, Pl. LIV.

1867 *Tragosia infundibuliformis*, Gray. Proc. Zool. Soc., p. 513.

1876 *Phakellia infundibuliformis*, Carter. Ann. Nat. Hist., ser. 4, vol. xviii, p. 240.

Habitat.—Deep water in the Minch (N.). Mr. Carter (l. c.) records this sponge as having been procured in the "Porcupine" Expedition of 1869 down to a depth of 345 fathoms.

The ordinary size of this sponge when fairly grown is about four inches high, and five or six inches in the diameter of the cup. My largest example, however, is nine inches across the lips of the cup and four and a half inches high. This has a simple crateriform shape, but another, which is seven and a half in diameter, divides a little above the base into seven fan-shaped lobes, which expanding overlap each other in regular order, so that the whole make a shallow but well-formed cup.

39. ISODICTYA DISSIMILIS, *Bow.*, II, 318; III, 139, Pl. LV, figs. 1—3.

1867 *Tragosia dissimilis*, Gray. Proc. Zool. Soc., p. 513.

This is one of the only British sponges which

Schmidt has identified with those found by himself in the Mediterranean and Adriatic Seas. He synonymises it with his *Axinella polypoides* ('Spongiens-Fauna des Atlantischen Gebietes,' 1870, p. 77).

40. *ISODICTYA GRACILIS*, *Bow.*, II, 331 ; III, Pl. LVIII, figs. 23—26.

41. *ISODICTYA INVALIDA*, *Bow.*, III, 289, Pl. LXXXV, figs. 8—10.

Habitat.—I procured a massive specimen an inch and a half long, rather more than an inch broad, and three quarters of an inch high, having five or six conspicuous oscular openings, between tidemarks at Westport Bay, Co. Mayo, this being a second locality for the species (N.).

42. *ISODICTYA NORMANI*, *Bow.*, II, 320 ; III, Pl. LVI, figs. 1—5 ; I, Pl. XXXVI, fig. 376.

43. *ISODICTYA CORIACEA*, *Bow.*, III, 228, Pl. LXXVI, figs. 7—12.

1881 *Dirrhopalum coriaceum*, Ridley. Lin. Soc. Jour. Zoology, xv, p. 481, Pl. xxix, figs. 3—7.

44. *ISODICTYA HISPIDA*, *Bow.*, n. sp., IV, Pl. XII, figs. 1—5.

"Sponge massive, sessile; surface even, minutely hispid. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane abundantly spiculous; tension spicula acuminate, nearly equal in length, but variable in

diameter, rather evenly dispersed; retentive spicula bidentate, equi-anchorate, minute, few in number. Skeleton rather irregular in structure; primary lines of rete uni- or bispiculous, rarely trispiculous; spicula acuate, comparatively large, uniform in size; secondary lines uni- or rarely bispiculous; tension spicula acuate, slender, few in number; retentive spicula bidentate, equi-anchorate, frequently rather more numerously dispersed in the interstitial membranes than in the dermal one. Sarcode rather abundant.

“*Colour*.—In the dried state, dark grey.

“*Habitat*.—Roundstone Bay, Ireland; Rev. A. M. Norman.

“*Examined*.—In the dried state.

“I received two small specimens of this sponge, deeply embedded amid the short branches of two specimens of *Nullipora polymorpha*. To the unassisted eye their surfaces appeared smooth and even, but when sections at right angles to the surface were examined in Canada balsam it was seen that they were abundantly hispid, the hispidation being produced by the prolongation and projection of the distal terminations of the primary fibres of the skeleton. These defensive organs most frequently consist of two or three spicula, which diverge slightly from each other, and are frequently projected more than the length of a single spiculum beyond the surface of the dermal membrane. This mode of armature is very characteristic of the species. The dermal membrane is abundantly supplied with tension spicula, which are irregularly but rather evenly dispersed, so that they sometimes appear to simulate a widely-constructed reticulation. They are about the same length

as those of the skeleton, but while those of the skeleton are nearly uniform in length and diameter, those of the dermis, although tolerably uniform in length, vary to a great extent in their diameter, many of them not being half the diameter of a completely developed skeleton one, many of which are intermixed with those of the dermis. An average-sized skeleton-spiculum measured $\frac{1\frac{1}{8}}{150}$ inch in length, and its greatest diameter was $\frac{1}{4815}$ inch.

“The bidentate, equi-anchorate, retentive spicula are very sparingly dispersed in the dermal and interstitial membranes; they are best seen in the latter *in situ*, as in the former they are to a great extent obscured by the abundance of the sarcode in which they are immersed. They are very slender and delicate in their structure, requiring a power of about 400 linear to render them distinctly to the eye. They are uniform in size. One of the largest measured $\frac{1}{1500}$ inch in length.”

45. ISODICTYA FUCORUM (*Johnston*), II, 322; III, Pl. LVI, figs. 16—19.

Habitat.—Dredged off the Durham Coast and off Saints Bay, Guernsey (N.).

46. ISODICTYA ALDERI, *Bow.*, II, 323; III, Pl. LVI, figs. 20—26.

47. ISODICTYA EDWARDII, *Bow.*, II, 325; III, Pl. LVIII, figs. 15—18.

Habitat.—Three fragments of massive form, and

showing a tendency to branch, measuring from half to three quarters of an inch long, have been thus determined by Dr. Bowerbank. I procured them among the Hebrides, I think in the Minch (N.).

48. ISODICTYA LOBATA (*Montagu*), II, 326; III, Pl. LVIII, figs. 19—22.

1867 *Corybas lobata*, Gray. Proc. Zool. Soc., p. 537.

49. ISODICTYA PAUPERA, *Bow.*, II, 328; III, Pl. LV, figs. 4—7.

1861 *Halichondria paupera*, Bowerbank. List British Marine Invert. Fauna (Brit. Assoc.), p. 69.

Habitat.—Growing intermixed with *Microciona plumosa*, between tide-marks at Herm (N.).

50. ISODICTYA UNIFORMIS, *Bow.*, II, 329; III, Pl. LV, figs. 8—10.

51. ISODICTYA CLARKEI, *Bow.*, II, 330; III, Pl. XLIX, fig. 6; Pl. LVI, figs. 11—16.

1861 *Halichondria Clarkei*, Bowerbank. List Brit. Marine Invert. Fauna (Brit. Assoc.), p. 69.

Habitat.—Three fragments of this rare sponge, each about three quarters of an inch long, are in my cabinet, which probably when found formed one continuous branch, and then would have been an inch and three quarters long, and a sixth of an inch in greatest

diameter. These fragments were dredged in Westport Bay (N.).

52. *ISODICTYA BARLEEI*, *Bow.*, II, 333 ; III, Pl. LVII.

53. *ISODICTYA LACINIOSA*, *Bow.*, III, 219, Pl. LXXV, figs. 1—5.

1868 *Isodictya laciniosa*, Bowerbank. Last Report of Dredging among the Shetland Isles; Norman on Porifera, Brit. Assoc. Report, 1868 (1869), p. 333.

Habitat.—A small specimen dredged by Dr. Gwyn Jeffreys and myself in deep water in the Minch, and now in my cabinet, was considered by Dr. Bowerbank to be referable to this species (N.).

54. *ISODICTYA DUBIA*, *Bow.*, III, 325, Pl. XC, figs. 4—7.

“*Habitat*.—‘Westport bay, 4 fathoms. Orange coloured when alive.’

“I received two specimens of this species from the Rev. A. M. Norman thus labelled. They are both upon matted masses of slender fuci, one five inches in length, and the other four inches, and in the lobulated form and mode of disposition on the fuci they very closely resemble the type-specimen represented in Pl. XC, ‘Mon. Brit. Spongiadæ.’ The lobulous form appears in most cases to be derived from the sponge encasing short branches of the stems of the fuci. On making transverse sections of some of the lobes which had never undergone compression I found

the arrangement of the skeleton tissues much more regular than in those of the type-specimen, while in others the same confusion of the structures prevailed. In all the anatomical characters these specimens were in perfect accordance with those of the type-sponge, excepting that there was a slight difference in the size of the spicula. The spicula of the younger parts of Mr. Norman's specimens were of the same size as those of the type-specimen, but in the old and more mature parts they were rather longer and stouter than those of the type-sponge in the Liverpool Museum."

55. ISODICTYA IMITATA, *Bow.*, III, 226, Pl. LXXVI, figs. 3—6.

56. ISODICTYA NODOSA, *Bow.*, n. sp., IV, Pl. XII, figs. 6—7.

"Sponge massive, sessile, more or less nodose, parasitical. Surface minutely rugose. Oscula simple, large, frequently terminating in nodous elevations. Pores conspicuous, dispersed. Dermal membrane pellucid, sparingly spiculous; tension spicula subfusiformi-acuate, same as those of the skeleton. Skeleton multispiculous, rather irregular, secondary lines irregular, varying from unispiculous to bi- or tri-spiculous; spicula subfusiformi-acuate, minute, variable in diameter. Interstitial membranes aspiculous.

"*Colour*.—In the dried state, light brown.

"*Habitat*.—Birterbuy Bay, Ireland. Rev. A. M. Norman.

"*Examined*.—In the dried state.

“I received a single specimen of this species, three inches in length and one and a half inch in width, embracing numerous slender stems of a zoophyte, so that the specimen assumed the form of irregularly inosculating branches, occasionally having upon them nodous elevations with a single large simple osculum at the apex; other large simple oscula were dispersed on the sponge, the margins of which were scarcely, if at all, elevated above the dermal surface; some of the oscula were two lines in diameter. The minute rugosity of the surface is produced by the projection of the distal terminations of the primary lines of the skeleton beyond the dermal surface. The porous areas were visible in many parts by the aid of a lens of two inches focus. The dermal membrane has no special spicula appropriated to it. The dermal areas are most frequently aspiculous, but occasionally a few stray skeleton spicula are dispersed on their surfaces. The skeleton-rete is rather irregular, and the number of spicula in the primary lines vary to a considerable extent, and they are rarely so few as to allow of their being counted. The secondary lines are also irregular. A single spiculum frequently suffices to connect two of the primary lines, but they vary from one or two to four or five loosely clustered together. The whole of the spicula, whether stout or slender, are of the same form—fusiformi-acuate—the proximal end always being of less diameter than the middle of the shaft, but whether adult or immature they vary to some extent in their length.

“This sponge is very simple in its structural characters, but it is well distinguished from other nearly allied species by the forms of its spicula, and by the

total absence of retentive spicula in any part of the sponge."

57. ISODICTYA INVOLUTA, *Bow.*, n. sp., IV, Pl. X, figs. 1—4.

"Sponge massive, coating parasitically; surface smooth and even. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane abundantly spiculous; spicula acuate, slender, dispersed. Skeleton-rete regular; areas one spiculum wide; primary line mostly multispiculous; secondary lines regularly disposed, uni- or bispiculous; spicula acuate, stout. Interstitial membranes spiculous; tension spicula slender, acuate, same as those of the dermis, rather numerous.

"*Colour*.—In the dried state, dark brown.

"*Habitat*.—Dredged in Westport Bay, Ireland; Rev. A. M. Norman.

"*Examined*.—In the dried state.

"I received a single specimen of this species for examination from the Rev. A. M. Norman. It entirely fills up the interstices of a small specimen of *Nullipora polymorpha* an inch and a half in length by an inch in breadth, leaving only the extremities of the small branches visible.

"The anatomical structures are simple, but very characteristic. The dermal membrane is abundantly supplied with tension spicula of a very slender acuate form, their diameter being not more than about one third of that of the skeleton-spicula, while the lengths of the two are very nearly equal; their mode of disposition is quite irregular, crossing each other in every pos-

sible direction. The skeleton-rete is very regularly constructed, the primary lines consisting of from two or three spicula in thickness to a greater number than can be counted. The secondary lines rarely contain more than two spicula at nearly equal distances, so that the areas of the rete are nearly equal-sized oblongs. The spicula are of a stout acuminate form and are of nearly equal size. The tension-spicula of the interstitial membranes are like those of the dermis, and in some parts are rather numerously dispersed."

58. *ISODICTYA PERTENUIS*, Bow., n. sp., IV, Pl. XIII, figs. 1—4.

"Sponge massive, sessile. Surface even, slightly hirsute. Oscula simple, dispersed, few in number. Pores inconspicuous. Dermal membrane spiculous; spicula dispersed, not very abundant, minutely acuminate, long and very slender. Skeleton-rete open and very diffuse, rather irregular. Primary lines multi-spiculous; secondary lines bi- or trispiculous; spicula minute, acuminate, long and slender, very little larger than that of the dermis. Interstitial membranes sparingly spiculous; spicula same as those of the dermal membrane.

"*Colour*.—In the dried state, nut-brown.

"*Habitat*.—Tidemarks, Westport Bay, Co. Mayo, 1874; Rev. A. M. Norman.

"*Examined*.—In the dried state.

"There is nothing remarkable or especially characteristic in the external appearance of this sponge, of which there were three specimens. The largest example

envelopes irregularly the stem of a slender fucus for about three inches in length, and a projecting portion of it, about the size of a small hazel-nut, has a central canal about the eighth of an inch in diameter running through it and terminating at its summit as if it were the termination of a cloacal cavity, but I could not, without destroying the root of the sponge, determine whether this character prevailed throughout the whole of the sponge. The general mass is rather irregular in its anatomical structure, and consists of but one form of spiculum, very minute, slender, and purely acuate, those of the skeleton varying from the dermal ones only in being slightly the stouter of the two. The extreme tenuity of these organs is, in truth, the most striking specific character of the sponge, and it readily separates it from other nearly allied species, as it requires a power of not less than about 400 linear to define either those of the skeleton or the dermal membrane with certainty. An average-sized spiculum of the dermal membrane measured $\frac{1}{500}$ inch in length, and its greatest diameter $\frac{1}{15000}$ inch. Two of skeleton-spicula measured $\frac{1}{187}$ inch in length and $\frac{1}{10000}$ inch in diameter, and $\frac{1}{158}$ inch in length and $\frac{1}{8752}$ inch in diameter. The dark amber-coloured sarcode is sufficiently abundant in all parts of the sponge to render it rather difficult to see the spicula distinctly *in situ*; and their separation from the sponge by boiling a portion of it in nitric acid, and mounting the spicula in Canada balsam, is quite necessary to obtain a clear idea of their forms and proportions. I examined the membranous structures and the spicula thus prepared and mounted with great care, but I could not detect any other forms of

spicula belonging to the sponge. A few adventitious spicula of much greater size from other sponges were embedded on its surface and amid its structures."

59. *ISODIOTYA SCITULA*, Bow., n. sp., IV, Pl. IV, figs. 1—3, and Pl. IX, figs. 1—3.

"Sponge massive, sessile. Surface even, minutely but strongly hispid. Oscula simple, dispersed, minute. Pores inconspicuous. Dermal membrane spiculous, spicula dispersed; tension-spicula acuate, few in number, same size as those of the skeleton; retentive spicula bidentate equi-anchorate, very minute and slender, rather sparingly dispersed. Skeleton—primary lines multispiculous; secondary lines, mostly unispiculous; rather irregularly disposed; spicula acuate, small. Interstitial membranes pellucid, aspiculous.

"*Colour*.—In the dried state, light ochreous yellow.

"*Habitat*.—Roundstone Bay, Ireland; Rev. A. M. Norman.

"*Examined*.—In the dried state.

"I received several specimens of this pretty little sponge from my friend the Rev. A. M. Norman for examination; they were seated amid the branches of small specimens of *Nullipora polymorpha*, and none of them exceeded the size of a large pea. To the unassisted eye the surface appears even and smooth, and it is only when a portion of the surface is mounted in Canada balsam and viewed with a power of about 100 linear, that it is seen to be abundantly and strongly hispid, the hispidation being produced by the projection of the distal terminations of the primary fibres of

the skeleton. The spicula, slightly diverging from each other, form a very striking and effective defence to the structures beneath them.

"The oscula require the aid of a lens of an inch focus to render them distinct to the eye.

"The dermal membrane is rather sparingly furnished with tension-spicula; but the minute bidentate equi-anchorate retentive spicula are much more numerous embedded in the sarcode of the membrane, but from their minuteness they may very readily escape observation. Two of the largest measured $\frac{1}{1364}$ inch and $\frac{1}{1666}$ inch in length, and the shafts of the dentes are extremely slender, requiring a power of about 400 linear to render them distinct to the eye, in *situ*, when mounted in Canada balsam. They are not evenly dispersed; in some parts they are rather few in number while in other parts they occur in much greater numbers. The primary lines of the skeleton consist of from three to five or six spicula in the fasciculus, very rarely more. The interstitial membranes are very pellucid; and, although I searched diligently for them, I could not find the slightest indication of either tension or retentive spicula."

60. ISODICTYA COLLINA, *Bow.*, n. sp., IV, Pl. XIV, figs. 6—13.

"Sponge sessile, massive, tumulous. Surface minutely hispid. Oscula slightly elevated and marginated, terminating each tumulus. Pores inconspicuous. Dermal membrane reticulated; rete unispiculous, spicula acuate or subfusiformi-acuate, stout, as long as those

of the skeleton; tension spicula acuate, long and slender, very few in number; retentive spicula bihamate, simple and contort, large but slender, very few in number; also bidentate equi-anchorate minute and rather numerous; and dentate palmato-equi-anchorate, few in number. Skeleton—primary lines multispiculous, spicula rather numerous, acuate, short and stout; secondary lines rarely more than bispiculous. Interstitial membranes spiculous; spicula same as those of the dermal membrane, but fewer in number.

“*Colour*.—Alive, orange; dried, ochreous yellow.

“*Habitat*.—Roundstone Bay, Ireland; Rev. A. M. Norman.

“*Examined*.—From spirit.

“I received this sponge in a small bottle of spirit from the Rev. A. M. Norman. It consists of five small tumulous masses irregularly disposed on a portion of the roots of *Fucus*. The largest does not exceed half an inch in height, and very little more in its greatest basal diameter. There is no appearance of hispidation of the surface of the sponge to the unassisted eye, but when a section at right angles to the surface is mounted in Canada balsam it becomes strikingly apparent. It is produced by the projection of the distal termination of the primary lines of the skeleton for about the length of a single spiculum, and when thus projected they separate at small angles to the axis of the skeleton-fibre, thus forming slight groups of very effective external defensive spicula. The oscula are situated one on each tumuloid mass of the sponge; they are slightly elevated and when fully developed have a thin margin, and have every appearance of being cloacal orifices rather than oscula.

“The dermal membrane is thin and pellucid and the rete with which it is furnished is regular, but the areas differ somewhat in form, but rarely vary from that of a triangle. The tension-spicula are very slender and much longer than those of the rete, and they require a power of about 400 linear to render their forms distinct to the eye. The bihamate retentive spicula are very few in number, and from their slender proportions are not readily to be detected *in situ*; an average-sized one measured $\frac{1}{48}$ inch in length. The bidentate equi-anchorate spicula are by far the most numerous of all the retentive forms; they are rather irregularly distributed on the dermal membrane, sometimes they occur in considerable numbers, while on other parts they are few in number; they are very minute and slender, not exceeding $\frac{1}{1200}$ inch in length and require a power of about 500 linear to render their forms distinctly to the eye. The dentate-palmato-equi-anchorates are very few in number, their palms are short but well produced, and they are of the same length as the bidentate-equi-anchorates.

“The skeleton is very regular and compact in its structure, and in conjunction with the other parts of its organisation renders this species readily distinguishable from any other nearly allied species. The retentive spicula are very sparingly dispersed on the interstitial membranes, and they are not readily distinguished *in situ* amid the sarcode in which they are immersed.

“In a small portion of the basal membrane of the sponge the long slender acuate tension-spicula were much more numerous than on the dermal membrane,

and on some portions of it they exhibited an inclination to fasciculation."

61. *ISODICTYA BEANII*, *Bow.*, II, 334; III, Pl. LVIII, figs. 1—6.

1881 *Clathria Beanii*, Ridley. Jour. Lin. Soc. Zoology, xix, p. 485.

62. *ISODICTYA FUNALIS*, *Bow.*, n. sp., IV, Pl XV, figs. 6—10.

1875 *Isodictya funalis*, Bowerbank. Jeffreys and Norman, Submarine Cable Fauna, Ann. Nat. Hist., ser 4, vol. xv, p. 176.

"Sponge massive, sessile. Surface smooth, but uneven. Oscula simple, dispersed, minute. Pores inconspicuous. Dermal membrane pellucid, spiculous; tension-spicula acuminate, short and stout, subfasciculate, rather numerous, basally incipiently spinous; retentive spicula bi- and tridentate equi-anchorate, rather numerous, and rarely palmato-tridentate equi-anchorate; also simple and contort, bihamate, minute and very slender, rather few in number. Skeleton—spicula acuminate, stout, rather short, basally incipiently spinous; primary lines tri- or quadrispiculous, rarely more; secondary lines mostly unispiculous, rarely more than bispiculous. Interstitial membranes sparingly spiculous; spicula same as those of the dermal membrane.

"*Colour*.—In the dried state, milk-white.

"*Habitat*.—On one of the Atlantic cables 150 miles from the Lands End in 200 fathoms; Sir James Anderson.

"*Examined*.—In the dried state.

"On October 8th, 1874, I received five specimens of this species from my friend the Rev. A. M. Norman for examination. They were brought up attached to one of the Atlantic cables by stems of a *Hydrozoon* which they surrounded in small masses not exceeding half an inch in length and three or four lines in greatest diameter. They were in a good state of preservation, but were very friable. A few minute simple oscula were detected by the aid of a lens of two inches' focus. The dermal membrane affords good specific characters. The disposition of the tension spicula is irregular to a very considerable extent; their fasciculi sometimes contain eight or ten spicula loosely compacted, at other times they consist of only two or three with single spicula dispersed in various directions around them. They are very equable in size, and are purely acuate in form. The retentive spicula are not very numerous, and are very irregularly distributed; the bidentate equi-anchorate predominate in number; the tridentate ones are less numerous, and the palmato-tridentate equi-anchorate ones of very rare occurrence. The bihamate retentive spicula are few in number; they are very minute, and require a power of about 300 linear to render them distinct to the eye. The skeleton is somewhat irregular in its mode of disposition, but small portions of it in parts that have not suffered from compression presented a tolerably regular mode of structure. A very few retentive spicula were observed on some parts of the interstitial membranes, but I did not detect any of the tension spicula on those organs.

"This species is not referable to any known British one, but it is very probable that we shall hereafter

find it in deep water in the neighbourhood of our own coasts, as we frequently meet with the deep-water species near the Orkneys and Shetland.

63. *ISODICTYA HYNDMANI*, Bow.

1866 *Halichondria Hyndmani*. II, 264; III, 115, pl. xlv, figs. 7—15.

1867 *Alecion Hyndmani*, Gray. Proc. Zool. Soc., p. 534.

1874 *Isodictya Hyndmani*, III, 358.

“Among the specimens of British sponges in spirit received from the Rev. A. M. Norman there were some portions of the roots of fuci with thin incrusting sponges upon them. On one of these was a thin layer of *I. Hyndmani* labelled ‘Yellow, Roundstone Bay.’ The usual locality of this species is on *Pecten opercularis*, and this is the second case of my having found it incrusting either fuci or zoophytes. Although but in a very young condition its structural characters were very strongly produced, and the bipocellated and unipocellated retentive spicula were more numerous than is usually the case.”

64. *ISODICTYA LURIDA*, Bow., II, 336; III, Pl. LVIII, figs. 27—32; Pl. LXXXII, fig. 1.

“Among the sponges received from the Rev. A. M. Norman was a small, massive specimen of this species, an inch and a quarter in length; it was dredged in thirty-five fathoms off the Durham coast. The sponge was in the dried state, and in excellent condition for microscopical examination, and in some thin slices at right angles to the dermal surface I found in some

portions of the interstitial membranes several very minute bihamate spicula dispersed on the dermal membrane. They are very minute, slender, and require a power of at least 300 linear to render them distinctly to the eye. I did not detect this form of retentive spiculum in either of the specimens of the species previously examined."

65. ISODICTYA FIMBRIATA, *Bow.*, II, 337; III, Pl. LVIII, figs. 7—14.

1861 *Halichondria fimbriata*, Bowerbank. List Brit. Marine Invert. Fauna (Brit. Assoc.), p. 69.

1861 *Tereus fimbriatus*, Gray. Proc. Zool. Soc., p. 537.

This interesting sponge has been recorded by Schmidt as having been found in the seas near Denmark and Greenland.*

66. ISODICTYA TUMULOSA, *Bow.*, III, 344, Pl. XCII, figs. 1—7.

67. ISODICTYA RUGOSA, *Bow.*, III, 332, Pl. XCI, figs. 1—5.

"On the 23rd June, 1875, I received a specimen of this sponge in a bottle of sea-water in a living condition from Mr. Hillier, of Ramsgate. In the living condition the surface is not nearly so rugose as in the drier state, and the sponge abounds in gelatinous sarcode, which it sheds in considerable quantities on

* 'Grundzüge einer Spongien-Fauna des Atlantischen Gebietes,' 1870, p. 80.

being plunged in fresh water. In its natural state it feels soft and pulpy. On being dried it assumed precisely the same appearances as those presented by the types figured in Plate XCI, vol. iii, 'Mon. Brit. Spongiadæ.' The size of the specimen was two inches and a half long, greatest breadth one inch and a quarter, and thickness about half an inch."

68. *ISODICTYA IMPLICITA*, Bow., n. sp., IV, Plate XVI, figs. 7—14.

"Sponge massive, parasitical amidst *Nullipora polymorpha*. Surface smooth. Oscula simple, minute, dispersed. Pores inconspicuous. Dermal membrane spiculous; tension spicula dispersed or subfasciculate, slender attenuato-acuate, same size and form as those of the skeleton; and stout attenuato-acuate, both forms basally spinous; retentive spicula minute, bipocellate-anchorate, few in number, and rarely minute inequi-anchorate. Skeleton irregular and much complicated; primary lines multispiculous; spicula slender, attenuato-acuate, basally incipiently spinous, with an intermixture of stout attenuato-acuate ones, basally strongly spinous. Secondary lines irregular, varying from unispiculous to multispiculous; spicula same as in the primary lines. Interstitial membranes sparingly spiculous; spicula same as in the dermal membrane. Sarcodæ, dark purple.

"*Colour*.—In the dried state, dark purple.

"*Habitat*.—Westport Bay, Ireland, in 5 fathoms; Rev. A. M. Norman.

"*Examined*.—In the dried state.

"I received these specimens of this species from my friend the Rev. A. M. Norman for examination; the largest, slightly exceeding an inch in length, was rather less than an inch in diameter; the other two were each slightly less than half the size of the largest specimen; they were all embedded amidst the short branches of *Nullipora polymorpha*. They were dredged in five fathoms, in Westport Bay, Ireland. The oscula are minute, and scarcely visible without the aid of a lens of two inches' focus. The dermal membrane was thickly coated with dark purple sarcode amidst which the tension spicula were embedded rather abundantly; they were mostly irregularly dispersed, but occasionally they were collected in loose flat fasciculi. The spicula are very slender, and their spination requires a power of about 500 linear to render it distinctly to the eye. The retentive spicula are very few in number, and very difficult to detect *in situ*. The minute bipocellate ones are more numerous than the minute inequi-anchorates; both forms require a power of about 500 linear to render their proportions distinctly visible, and it is only when prepared by boiling in nitric acid and mounting in Canada balsam that they can be distinctly seen.

"The generic characters of this sponge are very difficult of discrimination; situated amidst the short stout branches of *Nullipora*, and penetrated by them in every direction. The normal courses of the primary and secondary lines of the skeleton are very much interfered with by these peculiarities of situation, and to such an extent as in many parts to give the skeleton structures the more irregular reticulated form of a *Halichondria*; but notwithstanding these

complications the regularly compacted primary lines of the skeleton, however devious their courses may be, unmistakably characterise the normal structure of an *Isodictya*; when a careful scrutiny of its structural peculiarities is effected. The complication of the skeleton structures is also much increased by the irregular mode of disposition of the large attenuato-acuate spicula, the office of which appears to be really subsidiary to the true skeleton spicula amidst which they are irregularly disposed, among both those of the primary and secondary series. These spicula have all the structural appearances of large internal defensive organs; they vary to a considerable extent in size, some of the largest being twice as long as the smallest ones, but the basal portions appear to be all of nearly the same size; but notwithstanding these deceptive appearances, none of them were found erect and projected into the interstitial cavities of the sponge after the mode of the usual disposition of defensive spicula, but on the contrary, they all appeared to be prostrate among the spicula of either the primary or the secondary series of the skeleton lines; and not unfrequently a single one might be observed fulfilling the office of a secondary or connecting spiculum between two of the lines of the primary skeleton structure. They are very much stouter than those of the true skeleton spicula, and are very numerous. The basal ends of these spicula are abundantly spinous, and the spines are strongly produced, terminating hemispherically, while the spines of the shaft for about half the length of the spiculum become gradually less in size until they are at last in quite an incipient state.

“This remarkable sponge cannot readily be mistaken

for either of the very few British species to which it is anatomically allied, but from the peculiarities of its structural characters it requires more than the usual amount of circumspection in its examination to determine its species with certainty."

69. ISODICTYA INÆQUALIS, *Bow.*, n. sp., IV, Pl. XVI, figs. 1—6.

"Sponge massive, sessile, cavernous. Surface very rugged and full of elevated ridges and deep depressions. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane abundantly spiculous; tension spicula dispersed, subfusiformi-acerate, with obtuse terminations, or cylindrical, long and slender, not very numerous, and attenuato-acerate small and short, very numerous. Retentive spicula, bidentate equi-anchorate, few in number; and bihamate simple and contort, small and slender, rather numerous. Skeleton diffusive, irregular; primary lines multispiculous; secondary lines irregularly disposed, variable in number of their spicula; spicula subfusiformi-acuate, basally and apically spinous, rarely entirely spinous; spines few in number. Interstitial membranes—tension spicula attenuato-acerate, small and short, numerous; retentive spicula same as those of the dermis.

"*Colour*.—Dark brown in the dried state.

"*Habitat*.—

"*Examined*.—In the dried state.

"I received a small specimen of this species from my friend the Rev. A. M. Norman, who obtained it among others from Mr. D. Robertson. It is a small mass,

irregular in form, not exceeding an inch in diameter and a quarter of an inch in thickness. Its surface is very uneven and irregular, and its substance open and more or less cavernous. From the state of its under surface it has evidently been removed from a rock or stone by a sharp knife, and a few slender fucoid stems are incorporated in its substance and are adherent to its surface. The oscula are simple, none of them were more than about $\frac{1}{30}$ inch in diameter; some of them were on the elevated ridges and others in the developed portions of the surface. The dermal membrane is abundantly furnished with spicula. The tension spicula are of two sorts, subfusiformi-acerate or cylindrical and numerous small attenuato-acerate ones intermixed with them; the former are the true dermal tension spicula, while the latter properly appertain to the interstitial membranes, but both descriptions are numerous distributed on the membrane. The former are very irregularly disposed; on some parts they are numerous dispersed without the slightest approach to order, while in other parts they are more or less fasciculated and occasionally approach to an irregular reticulation; the small attenuato-acerate ones appear always to be irregularly dispersed. The bidentate, equi-anchorate retentive ones are small, but rather stout in their proportions; a full-sized one measured $\frac{1}{8}\frac{1}{4}$ inch in length; they require a power of about 300 linear to render them distinctly to the eye when *in situ*. The bihamate retentive spicula are more numerous than the anchorates. They are rather slender in their proportions; a full-sized one measured $\frac{1}{7}\frac{1}{10}$ inch in length.

“The structure of the skeleton appears to be in every

way very irregular. The primary lines are rarely symmetrically disposed and the number of the spicula of which they are constructed varies considerably, and this, combined with the irregularity of the structure and mode of disposition of the secondary portions of the skeleton lines, presents the whole in so confused a condition as to render the isodictyal characters in many parts very difficult of detection, and the abundant presence of numerous small, acerate, interstitial tension spicula greatly increases the confusion of the structures; but a careful observation of the structural peculiarities of the primary lines of the skeleton decidedly determines their isodictyal character. The skeleton-spicula are constant in their structural characters, but they vary to a large extent in their diameters and in their mode of spination, some of them being sparingly but entirely spinous, while others were furnished with a few minute spines at the base and apex only.

“The tension spicula of the interstitial membranes are not equally abundant in all parts of the structures; in some parts they abound, while in others they are very few in number.

“The only two species of British sponges with which this species might possibly be confounded are *Isodictya lurida* and *I. rugosa*. In the first of these two species both the skeleton and the dermal tension spicula are nearly twice as long as those of *I. inæqualis*, the length of a fully developed spiculum being $1\frac{1}{8}$ inch, while that of *I. lurida* is $\frac{1}{4}$ inch, and the latter is also much less spinous than the former, and about the same inequality in size exists in the tension spicula of the dermal membrane. The skeleton-spicula of *I. rugosa* very closely resemble those of *I. inæqualis*

both in size and form, but the skeleton structure of *I. rugosa* is very much more regular in its arrangement, and the strikingly fasciculated arrangement of the spicula of its dermal membrane combined with absence of the small attenuato-acerate spicula that are so abundant in *I. inæqualis* readily distinguishes the two species."

70. *ISODICTYA DEFORMIS*, Bow., n. sp., iv, Pl. XIV, figs. 1—5.

"Sponge massive, sessile. Surface irregular, very rugged. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane spiculous; spicula dispersed, sparingly and rather equably acuate or sub-cylindrical, basally incipiently spinous, about the same length, but rather less in diameter than those of the skeleton; retentive spicula bihamate, small and slender, few in number, and very rarely bidentate-equi-anchorate. Skeleton—primary lines multispiculous; secondary lines variable in the number of their spicula, irregularly disposed acuate, basally spinous, rather short and stout.

"*Colour*.—In the dried state light brown.

"*Habitat*.—Wick, North Britain, in deep water; Mr. C. W. Peach.

"*Examined*.—In the dried state.

"I received a single specimen of this sponge from my friend Mr. C. W. Peach in 1866 too late for publication in vol. ii of this work. It fills nearly the whole of the inner surface of a valve of a common Mussel shell and is neither attractive nor interesting, but on

submitting a portion of it to microscopical examination I found that its structural characters could not be assimilated with those of any other known species of *Isodictya*.

“The oscula dispersed on its rugged and uneven surface are scarcely perceptible with the aid of a lens of about two inches’ focus, and no indications of the pores could be detected even in portions of the dermal membrane immersed in Canada balsam. The best specific characters are those obtained from the dermal membrane, the tension spicula of which are so equably arranged on some parts as to closely resemble a reticulation, while in other parts they are unmistakably dispersed. Their form is the same as those of the skeleton, regularly acuate, and they are basally spinous. Their length is $\frac{1}{364}$ inch and their diameter $\frac{1}{3164}$ inch, while those of the skeleton are $\frac{1}{115}$ inch in length and $\frac{1}{2857}$ inch in diameter. The retentive bihamate and bidentate spicula are few in number, especially the latter form, and they are so minute as to require a power of about 400 linear to render them distinct to the eye while *in situ*; and it is a remarkable character that the two forms are as nearly as possible of the same length, each of them varying from $\frac{1}{750}$ to $\frac{1}{1000}$ inch. The bidentate equi-anchorates are comparatively stout in their proportions, while the bihamates are remarkably slender. This equality in the length of the two forms is very unusual, the bihamate forms being most frequently twice the length of the anchorate ones. Both forms are sparingly dispersed on the interstitial membranes, and the bidentate equi-anchorates especially so.”

Genus 23.—**RAPHIODESMA**, *Bow.*, III, 235.

= *Raphioderma*, Bowerbank. Last Rep. Dredg. Shetland, Norman on Porifera, Brit. Assoc. Rep., 1868 (1869), p. 333.

1. **RAPHIODESMA FLOREUM**, *Bow.*, II, 190; III, 94, Pl. XXXVII, figs. 14—19.

1866 *Hymeniacion floreum*, Bowerbank. II, 190.

1867 *Carmia floreum*, Gray. Proc. Zool. Soc., p. 537.

1870 *Esperia florea*, Schmidt. Spong. Atlant. Geb., p. 76.

1874 *Raphioderma floreum*, Bowerbank. III, 94, pl. xxxvii, figs. 14—19.

Habitat.—On living shells of *Pecten varius*, covering thickly the valves, Laminarian zone, Westport Bay, Co. Mayo. The living sponge is of a purplish hue (N.).

2. **RAPHIODESMA LINGUA**, *Bow.*, II, 187; III, 237, 354, Pl. XLVII, fig. 8, and LXVII, figs. 1—6.

1861 *Halichondria lingua*, Bowerbank. List Brit. Marine Invert. Fauna (Brit. Assoc.), 1861, p. 69.

1866 *Hymeniacion lingua*, II, 187.

1867 *Mycale lingua*, Gray. Proc. Zool. Soc., p. 533.

1868 *Raphioderma coacervata*, Bowerbank. Last Report Dredging Shetland Isles, Norman on Porifera, Brit. Assoc. Report, p. 333.

1870 *Esperia lingua*, Schmidt. Spong. Atlant., p. 76.

1874 *Raphioderma lingua*. III, 237, 354, pl. xlvii, fig. 8, and lxvii, figs. 1—6.

This is the most massive and largest of British sponges. The specimen in my collection, described in vol. iii, p. 354, as eleven inches high, six inches and three quarters in breadth near the base, four inches near the middle, and one inch and a quarter in thickness, of tongue-like form, is evidently after all, large though it is, only a portion of the entire sponge. The

texture of this sponge is totally different from that of any other species with which I am acquainted. It has very much the appearance as though a mass of short pieces of tow had been subjected to great pressure so as to unite them together. It is only found in very deep water. In 1867 I dredged it in company with the type specimen of *Isodictya laciniosa* in 170 fathoms, twenty to twenty-five miles north by west of Burrafirth Lighthouse, Shetland.

3. *RAPHIODESMA SIMPLICISSIMUM*, Bow., III, 324, Pl. XC, figs. 1—3.

Habitat.—Filling up the interstices between the branches of *Nullipora polymorpha* dredged in shallow water, Westport Bay, Co. Mayo (N.).

4. *RAPHIODESMA SORDIDUM*, Bow., III, 230, 354, Pl. LXXVI, figs. 13—19.

5. *RAPHIODESMA FALLACIOSUM*, Bow., n. sp., IV, Pl. XVII, figs. 7—12.

“Sponge, coating irregularly. Surface rough and ragged. Oscula simple, dispersed. Pores inconspicuous. Dermis abundantly spiculous; spicula acuate, rather long and slender, fasciculated; fasciculi broad and flat, irregularly dispersed; bases and apices of the component spicula coincident. Retentive spicula dentato-palmate, inequi-anchorate, congregated in rosette-shaped groups, and bidentate inequi-anchorate,

dispersed, also bihamate, simple or contort, large, few in number. Skeleton—fasciculi numerous, irregularly disposed; spicula subfusiformi-acuate, short and stout.

“*Colour*.—Nut-brown in the dried state.

“*Habitat*.—Westport Bay, 6—7 fathoms, Ireland; Rev. A. M. Norman.

“*Examined*.—In the dried state.

“Among the specimens of British sponges dredged in Westport Bay by the Rev. A. M. Norman and sent to me for examination, there was a valve of *Pecten varius*, on which there were two patches of sponges; one about an inch in length of *Leuconia nivea*, and on the opposite side of the valve an incrustation of a rough and rugged dark brown sponge an inch and a half in length and not quite a quarter of an inch in thickness, and this, on a careful microscopical examination, proved to be a new species of *Raphiodesma*, in many respects closely resembling in structure *R. lingua*. The surface does not resemble that of *R. lingua*, and it has nothing of the tow-like appearance of that sponge; on the contrary, it is very rough and rugged in appearance and of a dark brown colour. In the forms of spicula of the dermis and the skeleton the two species correspond to a very considerable extent, and they also agree in their respective modes of disposition in all parts of the sponges, but they differ greatly in their proportions. Thus, although of nearly the same form, those of the skeleton of *R. lingua* are $\frac{1}{5}\frac{1}{4}$ inch in length and $\frac{1}{7}\frac{1}{8}\frac{1}{5}$ inch in diameter, while those of *R. fallaciosum* are only $\frac{1}{9}\frac{1}{1}$ inch in length and $\frac{1}{25}\frac{1}{00}$ inch in diameter; and the same inequality of size obtains in the retentive spicula of the rosette-like

groups of the dermis. Those of *R. lingua* measuring $\frac{1}{3\frac{1}{3}}$ inch in length, while those of the similar groups in *R. fallaciosum* were only $\frac{1}{8\frac{1}{8}}$ inch in length. A striking differential character also exists in the bihamate, retentive spicula of the two species. In *R. lingua* these organs are exceedingly numerous but very minute in the dermal membrane, while the same forms and size are entirely absent in the dermis of *R. fallaciosum*, and in the latter species, in lieu of these minute bihamate organs, there are a few comparatively large and strong bihamate spicula sparsely distributed on the membrane. The modes of structure and distribution of the dermal fasciculi are the same in both species, and the same observation holds good regarding the structure and congregation of the inequi-anchorate spicula of the rosette-like groups of the dermis; they are not composed exclusively of dentato-inequi-anchorate forms; a few of the bidentates are intermixed with them. The number of spicula in one of these groups is too numerous to be counted, and they are so small as to require a power of about 300 linear to render them distinct to the eye. With these closely resembling points of structure in the two species a close and critical examination and comparison of the two species is essentially necessary for a correct discrimination of the two species, but the presence or absence of the numerous minute bihamate spicula of the dermis of *R. lingua* represented in Plate LXXVII, fig. 6, vol. iii of this work, will, when a portion of the dermal membrane of the specimen in course of examination is mounted in Canada balsam, usually lead the observer to a correct conclusion. The differences in the general aspect of the two species may also assist in their dis-

crimination, but these are characters upon which very little dependence can be placed."

6. *RAPHIODESMA INTERMEDIUM*, Bow., n. sp., IV, Pl. XVII, figs. 1—6.

"Sponge incrusting roots of fuci, &c.; surface uneven but smooth. Oscula simple, minute. Pores inconspicuous. Dermal membrane spiculo-reticulated, rete irregular, variable in the number of its spicula; spicula acuate, rather long and stout, same as those of the skeleton; retentive spicula bihamate, simple and contort, large and numerous, and bidentate inequ-anchorate, minute, and few in number. Skeleton—fasciculi numerous, irregularly disposed, variable in the number of their component spicula, bases and apices of their spicula coincident; spicula acuate, rather long and stout; tension spicula acuate, long, and slender; retentive spicula same as those of the dermis, but less numerous.

"*Colour*.—Alive, scarlet; dried, light ochreous yellow.

"*Habitat*.—Roundstone Bay, Ireland, on roots of *Laminaria*; Rev. A. M. Norman.

"*Examined*.—From spirit.

"I received from my friend the Rev. A. M. Norman two small portions of the root-like base of a *Laminaria* covered by a thin incrustation of sponge, the colour of which when alive is stated to have been 'scarlet,' but when dried was of a light ochreous colour. I could not detect the oscula by the aid of a lens of two inches' focus, though they became visible as small simple

orifices in the portions of the sponge mounted in Canada balsam; nor could I under any circumstances detect the pores. When thus mounted for examination the dermal membrane exhibited excellent specific characters. Its reticulated structure was exceedingly well developed. The rete is variable in the number of its component spicula and the areas very variable in form, no two of them appearing to be of the same shape. There were no slender acuate tension spicula in the areas, but the bihamate, retentive spicula were rather abundantly but unequally dispersed, and occasionally, but rather rarely, the bidentate, inequ-anchorate, retentive spicula were apparent, but I did not observe in any case two of them together indicating a disposition to congregation into rosette-shaped groups. The component spicula of the rete are purely acuate, and are of the same size and form as those of the skeleton fasciculi. The arrangement of the skeleton fasciculi has rather a confused aspect, the bundles varying to a very considerable extent in the number of their component spicula, and crossing each other in every possible direction, and they also vary to some slight extent in length, but in all of them the bases and apices of their spicula are coincident. The confused appearance of the skeleton structure is increased to a considerable extent by the abundance of the long slender tension spicula which are dispersed in all parts of it. The retentive spicula are rather sparingly distributed amid the skeleton structures.

"There are only two species of British *Raphioderma* that might possibly be confounded with the one in course of description—*R. simplicissimum* and *R. sor-didum*. In the former species the spicula very closely

resemble both in size and form those of *R. intermedium*, but *R. simplicissimum* is entirely destitute of bihamate, retentive spicula, and in the dermis the spicula are very numerous and are irregularly dispersed, and in no degree approaching reticulation. The loosely fasciculated dermal spicula and numerous rosette-shaped groups of retentive, inequi-anchorate spicula in the dermis of *R. sordidum* readily separate it from *R. intermedium*. In truth the sponge in course of description is really an intermediate species between *R. simplicissimum* and *R. sordidum*.

"It is quite possible, though not very probable, from the rarity of the inequi-anchorate spicula in *R. intermedium* that hereafter a few rosette-shaped groups may be found in well-developed specimens of the species; as we find in *R. sordidum* they do not occur equally in all parts of the dermal membrane, and in some portions of it they are entirely absent."

Genus 24.—SPONGILLA, *Linn.*, I, 199; II, 10.

1. SPONGILLA FLUVIATILIS (*Pallas*), II, 339; I, Pl. IX, figs. 217, 218; Pl. XXII, figs. 517—519; III, Pl. LIX.

1867 *Ephydatia fluviatilis*, Gray. Proc. Zool. Soc., p. 550.]

2. SPONGILLA PARFITTI, *Carter*, III, 298, Pl. LXXXVI, figs. 5—12.

1868 *Spongilla Mayeni*, var. *Parfitti*, Parfitt. Sponges of Devonshire, Trans. Devon. Assoc. Liter. Sci. and Art, p. 17 (separate copy).

“On the 7th of February, 1874, I received by post from Dr. Battersby five small sponges which he had procured from the Lake of Killarney. Of these three were young *Spongilla lacustris*, and two were very small and young specimens of *Spongilla Parfitti*. The largest was a thin, nearly circular patch, not quite five lines in diameter. The smallest was a similar patch, but not more than two lines in diameter. In both the incipiently spinous skeleton spicula were abundantly present. This is the second habitat known of this sponge, and from two out of the five specimens sent being of that species we may expect hereafter to find it not uncommon in the Lake of Killarney.

“On the 30th of April, 1875, I received some fragments of *Spongilla Parfitti* from Dr. Battersby from Caragh Lake,* Ireland. Gemmules, or rather ovaria, in different states of development, were numerous in them.”

3. SPONGILLA SOEPTRIFERA, *Bow.*, III, 300, Pl. LXXXVI, figs. 15—17.

4. SPONGILLA LACUSTRIS (*Don.*), II, 342; I, Pl. IV, fig. 90; Pl. IX, fig. 203; Pl. XXII, fig. 320; III, Pl. LX.

Habitat.—I found this sponge in 1875 in the neigh-

* Lough Caragh, Co. Kerry, is famous in the eyes of naturalists as the habitat of the remarkable slug *Geomalacus maculatus*, Allman, which lives rather high up upon the rocks of the mountain overhanging the lake. I had the pleasure of procuring it there in 1870. It is not rare in this its only known locality (N.).

bourhood of Roundstone, Connemara, in a small pool not far from Lough Cregduff, the locality of that highly interesting plant *Naias flexilis* (Rostk.) (N.).

"In August, 1876, I received from my friend Dr. Battersby some specimens of *Spongilla lacustris* from Caragh Lake, which are remarkable on account of the extreme variety of form that they exhibit. One specimen was three inches in height, composed of seven slender branches of various length, none of them exceeding two lines in diameter. There were no indications of ovaria, but in all anatomical details they perfectly accorded with the structures of more fully developed specimens. The difference in their general aspect is so great as compared with specimens from the Thames and other well-known localities that a hasty observer might readily be led to believe them to be a new species."

SUBORDER IV, I, 200; II, 10.

Genus 25.—DESMACIDON, *Bow.*, I, 200; II, 10.

1. DESMACIDON FRUTICOSUS (*Montagu*), II, 345; III, Pl. LXI.

Habitat.—Fine masses dredged in Fermain Bay, Guernsey, in 1865 (N.).

2. DESMACIDON JEFFREYSII, *Bow.*, II, 304, 347; III, 157, Pl. LXII.

1866 *Isodictya robusta*, II, 304.

1866 *Desmacidon jeffreysii*, II, 347; III, 157, pl. lxii.

- 1867 *Gelhus robusta*, Gray. Proc. Zool. Soc., p. 538.
 1867 *Biemma Jeffreysii*, Gray. Proc. Zool. Soc., p. 539.
 1868 *Oceanapia Jeffreysii*, Norman. Last Report of Dredging
 among the Shetland Isles, Brit. Assoc. Rep., 1868
 (1869), p. 334.

It is beyond my comprehension how any one could place this species and *D. fruticosus* in the same genus; now that the structure of *Oceanapia Jeffreysii* is known. Dr. Bowerbank, in referring to my description of *Oceanapia*, the genus I established, to receive this species, quotes a single sentence only of the generic character, and subsequently states (III, 161), that I "proposed to make it the type of a new genus under the designation of *Oceanapia* from the similarity in form of the bulbous mass of the sponge to a swede turnip," and then goes on to argue against establishing genera on external form! In justice to myself, and for the information of the student, I think it well to quote here the following account of the sponge which I gave in the 'Brit. Assoc. Report,' 1868; but leave it to others to adopt or reject my genus as seems best to them:

"Genus.—*OCEANAPIA*,* *Norman*, n. g.

"Sponge consisting of a hollow sphere filled with sarcode, surrounded by a hard spongy crust of a very close and compact nature. From the opposite poles of the axis of the spherical or ovate body of the sponge there spring more or less numerous, simple, or branched fistulæ of great size and length; these fistulæ are also furnished at their base with prolongations which, passing inwards into the central cavity

* *Océanus*, and *napus*, a turnip.

of the sponge in the form of cylindrical branching tubes, are bathed in the great sarcodous mass. Skeleton spiculo-fibrous, irregularly reticulated; fibres polyspiculous, the primary lines (especially of the fistulæ) of great size. Spicula acerate, stout (Bowerbank, Vol. I, Pl. I, fig. 2), and very minute, in the form of half a ring, 'simple bihamate' (Bowerbank, Vol. I, Pl. V, fig. 109). Dermal membrane reticulate, rete for the most part unispiculous, spicula of the same two kinds as those of the skeleton.

"*Oceanapia Jeffreysii* (Bow.)=*Desmacidon Jeffreysii*, Bow., 'Brit. Spongiadæ,' Vol. II, p. 347=*Isodictya robusta*, id., ib., p. 304.

"In 1861 I dredged a portion of the spherical crust of the sponge, from which the fistulæ had been abraded. This having been placed in Dr. Bowerbank's hands, was considered by him to belong to the genus *Isodictya*, and is described in his work under the name *I. robusta*. In subsequent expeditions to Shetland I obtained many detached fistulæ, and also portions of the crust, which convinced me that the entire sponge, when found, would prove to be something very different from what had been imagined by Dr. Bowerbank from the type specimen. In 1864 some of the fistulæ were forwarded by Mr. Peach to Dr. Bowerbank, who regarded them as a new species of *Desmacidon* (*D. Jeffreysii*). At length during the past summer several perfect specimens of the sponge have been dredged, and it is thus proved to be a remarkable species, perhaps the most interesting, as it is also one of the largest of British Porifera.

"In form and size the adult sponge most strikingly reminds us of a full-grown swede turnip. Imagine

such a turnip to be going to seed, and to have sent up several shoots. Now, break these shoots off four or five inches from the bulb, strip off the leaves, as well as the fibrous portions of the roots, and scoop out all the interior of the turnip, leaving only the rind, and you will have a very fair idea of *Oceanapia*. The rind represents the spongy crust; the hollow interior is a cup filled with sarcode; the broken-off stems are the cloacæ, which are of about the size and shape of a finger, the smaller specimens having sometimes only one, but the larger as many as a dozen such cloacal fistulæ of various sizes, which are generally simple, but more rarely branched. The roots of the turnip represent other fistular appendages of smaller size than those which spring from the crown, and of more solid and stringy texture. These appear literally to take the place of roots, since in one instance they grasp a pebble with their extremities, and in other cases show evident signs of having been partially embedded among sand. My largest specimen contained nearly a pint of sarcode in the interior. This sarcode is of a deeper colour than is usual among the sponges, and when the dried *Oceanapia* is cut open the sarcode will be found lying on that side which has been downwards when drying, shrunk into a solid deep brown or almost black mass, having somewhat the appearance and consistency of cobbler's wax."*

3. DESMACIDON PEACHII, *Bow.*, II, 349; III, Pl. LXIII, figs. 1—7.

1867 *Biemma Peachii*, Gray. *Proc. Zool. Soc.*, p. 538.

* Norman, 'Rep. Brit. Assoc.', 1868 (1869), pp. 334—335.

4. *DESMACIDON CONSTRICTUS*, Bow., II, 350; III, Pl. LXXI, figs. 3—10.

1867 *Bismania constricta*, Gray. Proc. Zool. Soc., p. 538.

“When I characterised this species it was from the only specimen that I had then seen of the sponge, a fragment about two inches high, based on the remains of a coral, and so completely waterworn that very few of its specific characters were available for description. Since the completion of Vol. III of my ‘Monograph of British Sponges’ I received, August 20th, 1874, from the Rev. Mr. Norman a massive sponge of pale brown colour, which he had dredged in Westport Bay, County Mayo, Ireland. This, on a microscopical examination, proved to be *Desmacidon constrictus* in a fine state of preservation. The breadth of the specimen was three inches and a half, the thickness at the summit one inch and a quarter, and it tapered gradually downwards to the length of two inches and a quarter, terminating in a thin blunt basal edge about two inches wide. The form of this specimen is unlike that of the type, but the perfect state of preservation of all its structures enables me to give a more complete idea of its specific characters than that afforded by the first description.

“The surface in the dried state is slightly rugose, and sections in Canada balsam beneath a power of eighty linear exhibit minute groups, each consisting of four or five spicula, projecting through the dermal membrane so as to cause it to appear minutely hispid. The dermal membrane is abundantly furnished with tension spicula, thickly felted on all parts of its surface; they are of the same shape and length as those of the skeleton fibres, but not above half their

diameter; and the basal constriction, so characteristic of the skeleton spicula, is also present, but not so strikingly marked as in the larger ones of the skeleton fibres. The simple and contort bihamate retentive spicula are dispersed abundantly among the tension ones, and among them there are sparingly dispersed very minute inequi-bidentate anchorates, and a few inequi-dentato-palmates. The lengths of the latter two forms average the $\frac{1}{1168}$ th inch, while the length of the bihamates varied from $\frac{1}{468}$ th inch to $\frac{1}{336}$ th inch; and a very few minute and slender tricurvate, acerate tension spicula were dispersed among them.

"The oscula are small, simple, round or oval orifices dispersed on the surface of the sponge, and are not readily detected without the aid of a lens of two inches focus.

"In a specimen of the dermal membrane mounted in Canada balsam a few pores in an open condition were seen.

"The interstitial membranes were abundantly spiculous, but not to such an extent as the dermal, and the mode of disposition of the tension spicula was somewhat different, as in many parts they were more or less fasciculated, the fasciculi being disposed at about right angles to the longitudinal fibres, between which they were situated. These membranes were furnished with the same descriptions of retentive spicula as those of the dermal membrane.

"The additional information obtained from the examination of the structures of the specimen described above, enables me to render the description of its specific characters much more complete, and I pro-

pose the following series of characters to replace those in Vol. II, p. 350, 'Monograph of the British Spongiadæ.'

"Sponge massive, sessile. Surface slightly uneven, minutely hispid. Oscula simple, dispersed. Pores dispersed. Dermal membrane abundantly spiculous; tension spicula sub-fusiformi acuate, more or less constricted near the basal end, long and slender, very numerous, irregular, felted together; and tricurvate acerate, small and very slender, few in number; retentive spicula simple and contort bihamate, rather small, very numerous; and bidentate inequi-anchorate and dentato-palmato inequi-anchorate, very minute and few in number. Skeleton—rete open; fibre stout and compact; spicula subfusiformi-acuate, more or less constricted near the base, long and large. Interstitial membranes abundantly spiculous; tension spicula same size and form as those of the dermal membrane, dispersed or subfasciculated; retentive spicula same as those of the dermis.

"*Colour*.—In the live state pale brown.

"*Habitat*.—Shetland, Mr. C. W. Peach; Westport Bay, Co. Mayo, Rev. A. M. Norman.

"*Examined*.—In the dried state."

5. DESMACIDON INCOGNITUS, *Bow.*, III, 292, Pl. LXXXV, figs. 14—16.

6. DESMACIDON PANNOSUS, *Bow.*, III, 312, Pl. LXXXIX, figs. 1, 2.

"When I described and figured this sponge it was

from a small specimen an inch in height and about three-fourths of an inch in breadth. Since then I have received a much better developed specimen for examination from my friend Mr. T. Higgin, of Huyton, near Liverpool, who obtained it at Guernsey. This specimen is irregularly ramified in nearly the same plane. It is four inches and a quarter in height from its present base, its natural attachment not being present. The basal portion of the stem does not exceed in height that of the type specimen; immediately above its base it divides into three branches, each of which is about the same diameter as at the basal portion; two of the branches are short, but the third is two inches and a half in height, and it terminates by dividing into several branchlets, thus attaining a total height of four inches and a quarter. All the larger branches are fistulous, the central cavities being large, and the parieties comparatively thin; and one short branch near the base has an open termination.

"This specimen agrees very closely with the type in all its structural characters, but the more fully developed state of its growth requires an emendation of the specific characters derived from its external form, and I therefore propose the following to replace the one in Vol. III, p. 312:

"Sponge. Branching irregularly; branches fistulous, parieties thin. Surface rough, ragged, and open. Oscula unknown. Pores dispersed. Dermal membrane rather sparingly spiculous; spicula acuate, slender, same length as those of the skeleton. Skeleton-rete very open, fibre compact but rather slender; spicula acuate, short and stout. Interstitial

membranes rather sparingly spiculous, spicula same as those of the dermal membrane.

“*Colour*.—In the dried state light brown.

“*Habitat*.—Jersey, Rev. A. M. Norman; Guernsey, T. Higgin, Esq.

“*Examined*.—In the dried state.

“Mr. Higgin has informed me that he has deposited this interesting specimen in the Liverpool Museum, where it will be accessible to every student who may be desirous of seeing it.”

7. *DESMACIDON COPIOSUS*, Bow., III, 265, 357, Pl. LXXXII, figs. 2—8.

1869 *Desmacidon copiosus*, Bow. In ‘Notes on a few Hebridean Sponges, &c.,’ Ann. Nat. Hist., ser. 4, iii, p. 299.

“Among some fresh specimens of British sponges recently received from my friend, the Rev. A. M. Norman, were the two valves of a *Pecten varius*, one of which was entirely covered, and the other very nearly so, by this sponge, which did not exceed half an inch in thickness at any part of it. Under these circumstances the external characters were very different from those of the two specimens previously described, their surfaces being smooth and even, but having the thin, white, leather-like aspect of the earlier specimens. Anatomically, the structures were in perfect accordance with the type specimen. This sponge was dredged by Mr. Norman in Roundstone Bay, Ireland.”

8. DESMACIDON CAVERNULA, *Bow.*, III, 268, Pl. LXXXII, figs. 9—12.

9. DESMACIDON ROTALIS, *Bow.*, III, 327, Pl. XC, figs. 8—14.

“Mr. J. G. Waller found a specimen of this rare species on a root of *Laminaria* at Anstey Cove, Torquay.”

10. DESMACIDON SIMILARIS, *Bow.*, III, 319, Pl. LXXXIX, figs. 14—20.

“I received a small specimen of this sponge from the Rev. A. M. Norman; it was not more than about half an inch in length, but the fragment was in a good state of preservation. It was labelled ‘Scarlet, Westport, tidemark.’ A second specimen, also from Westport, but dredged in five fathoms, differs considerably from the type represented in Vol. III, Pl. LXXXIX, fig. 14, inasmuch as it is not parasitical. It is a rudely cup-shaped mass, two inches in height, with a very short pedicle, and is so unlike the forms of the specimens previously described as to be very likely to mislead the student who trusts in any degree to form as a discriminating character. It has been too well washed to retain all its specific anatomical characters as perfectly as those of the type specimen, but sufficient remain to place its identification beyond a doubt.”

11. DESMACIDON *ÆGAGROPHILUS* (Sculer, MS.), II, 352,
I, Pl. XIII, fig. 264; III, Pl. LXIII, figs. 8—14 ;
Pl. LXXXIII, fig. 23.

1867 *Ægagrophila varians*, Gray. Proc. Zool. Soc., p. 533.

1870 *Esperia ægagrophila*, Schmidt. Spong. Atlant., p. 77

“Among the sponges sent to me for examination by the Rev. A. M. Norman there was a specimen of *Desmacidon ægagropilus* labelled ‘Tidemarks, Birterbuy Bay.’ It was of an irregular form, two and a half inches long by two inches at the greatest width, but it did not exceed half an inch at its greatest thickness. It was of a dull cream-yellow colour, and its upper surface was abundantly corrugated or minutely papillated, and the general aspect was that of a very characteristic specimen of the species. On taking sections at right angles to the surface from the thickest end of the sponge, and a portion from the dermal surface, and mounting them as usual in Canada balsam, and examining them with a power of 200 linear, they presented a most anomalous appearance. In addition to the usual strong spiculo-fibrous skeleton of the *Desmacidon*, there were several detached fasciculi of skeleton spicula, and a considerable number of rosette-shaped groups of inequi-palmato anchorate retentive spicula; and I at once saw that I had before me the elements of two very distinct genera of species, *Desmacidon ægagropilus* and *Raphiodesma lingua* intermixed and so incorporated as to completely simulate a single individual of a most extraordinary structure. I carefully examined the sponge with a lens of two inches focus, but I could not discriminate the two discrepant tissues; but on taking sections and a portion

of the dermis from the opposite end of the sponge and examining them, as I had the first specimens mounted, the mystery was at once solved; the characteristic tissues of *Raphiodesma* were entirely absent, and the sections under examination exhibited all the characters of a pure and simple specimen of *Desmacidon ægagropilus*; and I became assured that the intermixture of tissues was partial, and existed only at one portion of the specimen. A thin section from the basal portion of the sponge afforded precisely the same evidence as the sections last described.

“The occurrence of the intermixture of these two species, from the close similarity of portions of the component parts of their respective bodies, is exceedingly interesting and instructive. The skeleton of the two species are both fusiformi-acuate, and the bihamate retentive spicula of each are exactly alike in form and in their abundance on the membranous tissues of each, so that it required no small share of experience of sponges to detect this remarkable mixture of structure.

“The beautiful rosette-shaped groups of the characteristic spicula of *Raphiodesma lingua* afforded an excellent clue to the solution of the mystery, and the contrast between the structures of the dermal membranes was also very decisive; while the dermal spicula of *D. ægagropilus* are slender and irregularly dispersed, those of *R. lingua* are stout and fasciculated, forming an irregular network. I ultimately succeeded in detaching a very characteristic fragment from the surface with a few of the fasciculi of the skeleton of *R. lingua* beneath it, without any portion of the structures of the *Desmacidon*. From all these appearances it is evident that the *Raphiodesma lingua* was in a very

early stage of its development, in truth, a mere pellicle of the structures.

"The occurrence of this singular mixture of species affords a valuable lesson to students of the Spongiadæ, as the occurrence of one species in a very young condition in small patches upon, or nearly enveloping, another is by no means an unusual occurrence among both British and Foreign species.

"I received another specimen of *Raphiodesma lingua*, dredged at Westport Bay in four fathoms by the Rev. Mr. Norman, which varied greatly from the usual and normal form of the sponge so as to render it very difficult of recognition by its external characters. It completely coated the gibbous valve of a *Pecten opercularis* for about a quarter of an inch in thickness, and the surface of the sponge was very much more rugged than is usual in this species."

12. DESMACIDON COLUMELLA, *Bow.*, III, 243, Pl. LXXVIII, figs. 6—8.

Genus 26.—RAPHYRUS, *Bow.*, I, 201; II, 10.

RAPHYRUS GRIFFITHSII, *Bow.*, II, 354, I, Pl. XIII, fig. 265; III, Pl. LXIV.

1862 *Papillina suberea*, Schmidt. *Spong. Adriat.*, p. 69.

1868 *Raphyrus Griffithsii*, Parfitt. *Sponges of Devonshire* (*Trans. Devon. Assoc. Lit. Soc. and Art*), p. 9 (separate copy).

1870 *Papillina suberea*, Schmidt. *Spong. Atlant.*, p. 77.

Very fine masses of this interesting sponge are

abundant, covering, and often entirely concealing, dead shells of *Pecten maximus* in Birterbuy Bay, Ireland. The sponge when living is of a lemon-yellow colour.

It has been recorded by Schmidt from the Mediterranean and from Florida.

SUBORDER V, I, 201; II, 11.

Genus 27.—DIPLODEMIA, Bow., I, 201; II, 11.

DIPLODEMIA VESICULA, II, 357; I, Pl. XIV, fig. 273; Pl. XXIII, fig. 324; Pl. XXXVI, fig. 377; III, Pl. LXX, figs. 12—14.

ORDER III, KERATOSA, I, 205; II, 12.

SUBORDER I, I, 205; II, 12.

Genus 28.—SPONGIONELLA, Bow., I, 206; II, 12.

SPONGIONELLA PULCHELLA (*Sowerby*), II, 359; I, Pl. XXXVII, fig. 380; III, Pl. LXV, figs. 5—8.

1861 *Spongia pulchella*, Bow. List. Brit. Mar. Invert. Fauna (Brit. Assoc.), p. 71.

1862 *Cacospongia scalaris*, Schmidt. Spong. Adriat. Meeres, p. 27, pl. iii, fig. 4.

1870 *Cacospongia pulchella*, Schmidt. Spong. Atlant. Geb. p. 76.

“Among the sponges I received for examination from the Rev. A. M. Norman, was a small specimen of

S. pulchella, dredged off the Durham coast in thirty-five fathoms of water. It is nine lines in height, and closely resembles in form the specimen of the same species represented by figure 6, Pl. LXV, vol. III, 'Mon. Brit. Spongiadæ,' excepting only that it has the natural base, two lines in diameter, attached to a small fragment of a shell. This specimen is in a fine state of preservation, and is remarkable from its having an abundance of gemmules or ovaries attached to the inner surface of the dermal membrane, and to the fibres and membranes in the interior of the sponge. A few of these bodies are somewhat oval, but by far the greater number are spherical. As it is usually the case under such circumstances they vary greatly in their size. I measured several of them; the smallest was $\frac{7}{150}$ th inch in diameter and the largest $\frac{1}{150}$ th inch, and specimens of every gradation in size between the two extremes were very numerous; and all of them were black and perfectly opaque; but in the remains of some of them that had apparently discharged their contents there were indications of their having contained numerous minute spherical molecules, such as we occasionally find in similar organs in other members of the Spongiadæ. One of these in a fine state of preservation measured $\frac{1}{3750}$ th inch in diameter. These gemmules or ovaries were attached indifferently to the membranes or fibres of the interior of the sponge, and from the section mounted in Canada balsam they appeared to be very numerous, and to be distributed through all parts of the sponge. It is the only case in which I have observed the reproductive organs in the genus *Spongionella*, but in a specimen of a keratose sponge from Australia, described by me in the 'Annals and

Magazine of Natural History,' vol. vii, 1841, pp. 129—132, I have described very similar reproductive organs."

SUBORDER III, I, 208; II, 13.

Genus 29.—CHALINA, *Grant*, I, 208; II, 13.

1. CHALINA OCULATA (*Pallas*), II, 361; I, Pl. XIII, fig. 262; III, Pl. LXVI.

1870 *Chalinula oculata*, Schmidt. Spong. Atlant. Geb., p. 77.

2. CHALINA CERVICORNIS (*Pallas*), II, 364; III, Pl. LXVII, figs. 1—3.

1870 *Chalina cervicornis*, Schmidt. Spong. Atlant. Geb., p. 77.

3. CHALINA MONTAGUI (*Fleming*), II, 366; I, Pl. XIII, fig. 263; III, Pl. LXVIII, figs. 3—5.

1861 *Haliclona Montagui*, Bow. List. Brit. Marine Invert. (Brit. Assoc.), p. 71.

1861 *Haliclona Columba*, Bow. L. c., p. 71.

1870 *Chalina Montagui*, Schmidt. Spong. Atlant. Geb., p. 77.

4. CHALINA FLEMINGII, *Bow.*, II, 370; III, 357, Pl. LXVIII, figs. 1 and 2.

1870 *Siphonochalina* (P) *Flemingii*, Schmidt. Spong. Atlant. Geb., p. 77.

5. *CHALINA GRACILENTA*, *Bow.*, II, 372; III, Pl. LXVII, figs. 4—6.

1861 *Haliclona gracilenta*, *Bow.* List. Brit. Marine Invert. (Brit. Assoc.), p. 71.

1870 *Chalina* (P) *gracilenta*, *Schmidt.* Spong. Atlant. Geb., p. 77.

"I received the largest specimen that I have seen of this sponge, among others, from the Rev. A. M. Norman, who stated that he received it from Mr. D. Robertson, who found it under stones at Isle of Cumbrae. It was an inch and three quarters long, nearly an inch in width, and an eighth of an inch in thickness; it had thirteen oscula at nearly equal distances from each other, and in its general aspect might have been very readily mistaken for a young specimen of *Ophlita-spongia seriata* when examined in the dried state."

6. *CHALINA LIMBATA* (*Montagu*), II, 373; III, Pl. LXVII, figs. 7—13.

1861 *Spongia limbata*, *Bow.* List. Brit. Marine Invert. (Brit. Assoc.), p. 71.

1870 *Chalinula limbata*, *Schmidt.* Spong. Atlant. Geb., p. 77.

7. *CHALINA GRANTII*, *Bow.*, II, 375; III, Pl. LXVIII, figs. 6 and 7.

1870 *Chalina Grantii*, *Schmidt.* Spong. Atlant. Geb., p. 77.

8. *CHALINA INORNATA*, *Bow.*, III, 277, 358, Pl. LXXXIII, figs. 12—16.

Genus 30.—OPHLITASPONGIA, *Bow.*, II, 14.

1. OPHLITASPONGIA PAPILLA, *Bow.*, II, 378 ; III, Pl. LXX, figs. 1—4.

1867 *Ophistospongia papilla*, Gray. Proc. Zool. Soc., 1867, p. 515 (misprint).

1870. *Clathria* (?) *papilla*, Schmidt. Spong. Atlant. Geb., p. 77.

“I received a fine specimen of this rare species of sponge for examination from the Rev. A. M. Norman. It was found at tidemark, Westport Bay; it was two and a half inches long by one inch and a half wide, and had sixteen papillæ. The basal mass did not exceed a quarter of an inch in thickness, and it had evidently been adherent to a rock or slab of stone.”

2. OPHLITASPONGIA SERIATA (*Grant*), II, 376 ; I, Pl. XVII, fig. 287 (as *Chalina seriata*); III, 167, Pl. LXV, figs. 1—4 (as *Ophlitaspongia seriata*).

1861 *Haliclona seriata*, Bow. List. Brit. Marine Invert. (Brit. Assoc.), p. 71.

1867 *Seriatula seriata*, Gray. Proc. Zool. Soc., p. 515.

This sponge is found in abundance coating shells, especially those of *Pecten varius*, while still alive in a few fathoms of water just inside the lighthouse at the entrance of Westport Bay, Co. Mayo. The sponge grows much more luxuriantly in this locality than I have met with it elsewhere, being thicker and more massive, and the oscula of much larger size than usual. On two young sponges from this same locality, Dr. Bowerbank has left the following note:—“Among the specimens sent to me for examination by the Rev. A.

M. Norman, were two small specimens of *Pecten varius*. One valve of each being nearly covered by a layer of sponge not exceeding half a line in thickness. On mounting a small portion of each in Canada balsam, I found them to be very young specimens of *O. seriata*, but in only a partially developed condition. The usual oscula were not apparent, and the defensive spicula based on the skeleton fibres were few in number and slender in their proportions. All the spicula characteristic of the species were present, but only sparingly so.

“ These specimens are very instructive, as without a careful microscopical examination their species certainly never would have been suspected.”

SUBORDER IV, I, 209; II, 15.

Genus 31.—VERONGIA, *Bow.*, I, 209; II, 15.

VERONGIA ZETLANDICA, *Bow.*, II, 380; III, 177, Pl. LXX, figs. 9—14.

1870 *Cacospongia Zetlandica*, Schmidt. *Spong. Atlant. Geb.*, p. 77.

SUBORDER VII, I, 211; II, 16.

Genus 32.—DYSIDEA, *Johnston*, II, 16.

1. DYSIDEA FRAGILIS (*Montagu*), II, 381; I, Pl. XIV, figs. 270—272; III, Pl. LXIX.

1870 *Spongelia fragilis*, Schmidt. *Spong. Atlant. Geb.*, p. 77.

1876 *Dysidea fragilis* (in 312 fathoms), Carter. *Ann. Nat. Hist.*, ser. 4, vol. xviii, p. 232.

"*Dysidea fragilis*. I received a specimen of this sponge from the Rev. A. M. Norman, presenting a very unusual aspect. It was a very thin stratum of irregularly reticulated tissue, which, from the small shells and other extraneous bodies adherent to the lower surface, had evidently occupied a recumbent surface. Its internal structure was also very singular. A few of the larger fibres were well filled with sand, while by far the greater number were entirely destitute of that material. A similar paucity of sand may be frequently observed in specimens from Brighton."

Mr. Hyatt, in his '*Revision of the North American Porifera*,' pt. ii, 1877, has recorded what he believes to be this Sponge from Zanzibar and also from Biscayne Bay, Florida; but his description and photographic figures are not sufficient to enable us to determine with certainty whether his *Dysidea fragilis* is really our species or not; fig 17 does not so much remind us of the facies of British specimens as does the washed example represented in his fig. 18.

Marshall* has published a valuable paper on the Sponges belonging to this family, but the British species had not fallen under his observation. This paper must, however, necessarily be referred to by any one studying this genus.

2. DYSIDEA CORIACEA, Bow., III, 341, Pl. XCI, fig. 20.

"A specimen was dredged by the Rev. A. M. Norman in from five to six fathoms in Westport Bay, Co. Mayo, Ireland. The sponge is two inches and a half

* "Untersuchungen über Dysideiden und Phoriospongien," 'Zeit. Wiss. Zool,' xxxv, 1880, p. 88.

in height, the same in breadth, and one inch and a half in greatest thickness. It is thin at the base and increases in thickness upwards. Numerous oscula occur at and near the distal termination of the sponge, they exceed twenty in number. The greater number were funnel-shaped orifices, the bottom of some being open while others were closed by a membrane. The general surface characters of the coriaceous texture were in perfect accordance with those of the type specimen."

CATALOGUE

OF

WORKS AND PAPERS ON SPONGES.

DR. BOWERBANK'S volumes contain scarcely any references to the writings of others. It has appeared to the Editor, therefore, very desirable to furnish the student with a list of the works and papers which have been written on the subject. He has therefore drawn up with great care the catalogue which follows. It will be found, he trusts, tolerably complete. If, however, omissions—and there must necessarily be such—are found he would plead as extenuating circumstances: first, that it is the first catalogue of the kind which has been attempted; secondly, that it has been prepared in the country, where he has had to depend almost entirely on his own private library.

No doubt there are many other papers scattered among the very numerous natural-history periodicals of Europe and America, and also among the Transactions of their scientific societies, which have escaped his notice. He has purposely only referred to a few out of the many general text-books on Zoology in which reference to the structure and organisation of the

Sponges may be found. The earliest writers quoted are those upon whose figures and description Linnean and Lamarckian species have been founded, and whose writings, therefore, may be considered as entering into the scientific bibliography of the class.

Works and papers on fossil sponges are excluded, except in a few cases where they contain references to arrangement and recent species.

The names of authors are arranged chronologically, but when an author's name is once introduced all that he is known to have subsequently written is given after the name.

REFERENCE LIST TO AUTHORS IN THE FOLLOWING CATALOGUE.

	PAGE		PAGE
Austin	203	Eckhel	216
Balfour	223	Ehlers	216
Balsamo-Crivelli	210	Ehrenberg	203
Barrois	219	Eimer	216
Bell	199	Ellis	195
Bellamy	201	Ellis and Solander	196
Beltremieux	211	Esper	196
Beneanme	195	Fabricius	196
Bertoloni	223	Fischer	213
Bianconi	201	Fleming (J.)	199
Blainville	200	Fleming (W.)	216
Bocage	212	Forel	218
Bosc	199	Fullager	219
Bowerbank	201	Funck	216
Brandt	209	Ganin	221
Brotherus	222	Gervais	200
Carter	204	Gosse	208
Cavolini	196	Grant	199
Chiaje	199	Gray (J. E.)	197
Chimmo	223	Gray (S. F.)	197
Clark	211	Greene	223
Claus	212	Grimm	219
Costa	203	Grube	216
Cones and Yarrow	221	Gunnerus	196
Couch	203	Hadlow	217
Czerniavsky	221	Häckel	211
Dawson	222	Hancock	208
Desor	208	Hardwicke	199
Deszo	222	Harting	211
Dobie	208	Herklots and Marshall	213
Donati	195	Higgin	217
Duchaissaing	211	Hogg	201
Duchaissaing and Michilotti	211	Huxley	208
Dujardin	201	Hyatt	220
Duncan	222	Imperato	195
Dutrochet	200	Jameson	196
Duvernoy	201	Johnston	200
Dybowski	220	Keller	217

	PAGE		PAGE
Kent	214	Plancus	195
Koerte	208	Pontoppidan	195
Kölliker	210	Potts	223
Kruckenbergl	222	Quoy and Gaimard	200
Lamarck	196	Raspail	199
Lamoureux	197	Ridley	222
Lankester	217	Risso	199
Laurent	200	Rumph	195
Lecoq	209	Sars	216
Leidy	208	Savigny	223
Lereboullet	201	Schuffner	208
Lichtenstein	196	Schmidt	210
Lieberkühn	209	Schultze	209
Linnæus	195	Schulze	218
Lorenz	210	Schuffner	220
Lovén	213	Schweigger	197
Ludvig	197	Seröter	196
Lütken	218	Seba	195
McIntosh	217	Selenka	212
Marenzeller	222	Semper	212
Marshall	218	Sloane	195
Marsilli (de)	195	Smith and Harger	217
Martens	213	Sollas	220
Mayen	201	Sorby	218
Mayer	208	Sowerby	196
Metschnikoff	217	Steward (C.), 1	197
Mereschkowsky	221	Steward (C.), 2	215
Michelin	203	Strange	196
Mickluch-Maclay	213	Strickland	208
Milne Edwards	223	Stutchbury	203
Möbius	216	Thomson	212
Montagu	196	Thompson	223
Moore	214	Tilesius	196
Moulins	216	Turgot	195
Müller	196	Turpin	200
Murie	220	Turton	196
Nardo	200	Vahl	196
Norman	214	Vaillant	214
Nozeman	223	Valenciennes	209
Olivi	196	Verrill	215
Owen	203	Vosmaer	222
Pagenstecher	216	Waller	219
Pallas	195	Wright	213
Parfitt	212	Zittel	221
Payer	219		

CATALOGUE.

- IMPERATO (F.). Dell' Historia Naturale, fol., Napoli, 1599.
- RUMPH (G. E.). D'Amboinsche Bariteitkamer, fol., Amsterdam, 1705.
- SLOANE (H.). Voyage and Natural History of Jamaica, 2 vols., fol., London, 1707.
- BENEAUME (—). *Spongia fluviatilis, fragilis et piscem olens*, Mém. Acad. Sc. Paris, 1714, p. 231.
- MARSILLI (Comte de). Histoire Physique de la Mer., fol., Amsterdam, 1725.
- SEBA (A.). Locupletissimi rerum naturalium thesauri accurata descriptio, 4 vols., fol., Amsterdam, 1734-65.
- PLANCUS (J.). Ariminensis, de Conchis minus notis liber, 4to., Venetiis, 1739.
- DONATI (V.). Della Storia Naturale Marina dell' Adriatico, Venezia, 1750.
- PONTOPPIDAN (E.). Natural History of Norway, fol., London, 1755.
- ELLIS (John). Essay towards a Natural History of the Corallines and other marine productions of a like kind commonly found on the coasts of Great Britain and Ireland, 1755, p. 78.
- On the nature and formation of Sponges, Phil. Trans., vol. 55, 1765, p. 280.
- TURGOT (E. F.). Mémoire instructif, * * diverses curiosités d'Histoire Naturelle, 8vo., Paris et Lyons, 1758.
- PALLAS (P. S.). Elenchus Zoophytorum, 1766, p. 375.
- Reise durch verschiedene Provinzen des Russischen Reichs, Theil III, 1776, pp. 100, 101, and (Anhang) p. 710, No. 58 (*Spongia Baicalensis*).
- Charakteristik der Thierpflanzen, 1787, p. 221 (*Spongia fluviatilis*), and pp. 235, 236 (*Sp. Baicalensis*).
- LINNÆUS. Systema Naturæ, edit. xii, 1767.

- STRANGE (John). An Account of some very perfect and uncommon specimens of *Spongia* from the Coast of Italy, Philos. Trans., vol. lx, 1770, p. 179.
- GUNNERUS (J. E.). Von verschiedenen Seeschwämmen, Drontheim Gesellsch. Sshrift, vol. 4, 1776, p. 65.
- MÜLLER (O. F.). Zoologiæ Danicæ prodromus, Hafniæ, 1776.
— Zoologica Danica, 4 vols., fol., 1777—1806.
- FABRICIUS (O.). Fauna Grœnlandiæ, 1780.
- CAVOLINI (F.). Memorie per servire alla storia de Polipi Marini, 4to., Napoli, 1785.
- ELLIS and SOLANDER. Natural History of many curious and uncommon Zoophytes, collected from various parts of the Globe, 4to., 1786.
- ESPER (E. J. C.). Die Pflanzenthier, Nürnberg, 4to., 3 vols., 1788—1800.
- SCHRÖTER (J. S.). Beschreibung einer neuen Spongie des süßsen Wassers, *Spongia canalium*, Der Naturforscher, St. 23, 1788, p. 149.
- OLIVI (G.). Zoologia Adriatica, 4to., Bassano, 1792.
- VAHL (Mart.). Beskrivelse af en ny Sõe-svamp., Skrivten Naturhist. Selsk., Bd. 2, Heft 2, 1793, p. 51.
- LICHTENSTEIN. Ueber die Badeschwämme, Lichtenberg, Voigt's Magaz., ii, St. 2, 1796, pp. 17—19.
- TURTON (W.). Translation of Linnæus's General System of Nature, amended and enlarged, 1800-6, 7 vols.
- TILESIIUS (W. G.). Zwei verschiedene Species (*Spongia villosa* and *ocellata*) in einem Röhrenschwamme vereinigt, Voigt's Magaz., Bd. vi, 1803, pp. 277—288.
- SOWERBY (J.). British Miscellany, 1804-6 (Pl. LX, *Spongia cancellata*; Pl. XLIII, *Spongia pulchella*).
- JAMESON (R.). Catalogue of Animals, of the Class Vermes, found in the Frith of Forth (Cat. including 7 Sponges), Wernerian Memoirs, vol. i, 1811, p. 561.
- MONTAGU (George). An Essay on Sponges, with descriptions of all the species that have been discovered on the coast of Great Britain, Wernerian Memoirs, vol. ii, p. 67, 1818 (paper read 1812).
- LAMARCK (J. B. P. A.). Sur les Polypiers empâtés Éponges, Ann. du Muséum, tom. xx, 1813, pp. 294—312, 370—380, and 432—458; Mém. du Muséum, tom. i, 1825, pp. 69, 162 and 331.

- LAMARCK (J. B. P. A.). *Histoire Naturelle des Animaux sans Vertèbres*, 1816.
- — — deuxième édition, 1835.
- LAMOUROUX (J. V. F.). *Histoire des Polypiers Coralligènes flexibles*, vulgairement nommés Zoophytes, 1816, Caen, or (translated) *Corallina*, 1824, London.
- Exposition méthodique des genres de l'ordre des Polypiers, avec les descriptions de celles des principales espèces, 1821, Paris.
- STEWART (Charles). *Elements of the Natural History of the Animal Kingdom*, 1817, Edinburgh.
- LUDVIG (C. H. P.) and UHLE (A. F.). *Diss. pharmacol.-med. de Spongia marina*, Lipsiæ, 4to, 1819.
- SCHWEIGGER (A. F.). *Beobachtungen auf Naturhistorischen Reisen*, 1819.
- *Handbuch der Naturgeschichte der Skeletoser ungegliederten Thiere*, &c., 1820.
- GRAY (S. F.). *Natural arrangement of British Plants*, 1821.
- GRAY (J. E.). The situation and rank of Sponges in the scale of Nature, and on their internal structure, *Zoological Journal*, vol. i, 1825, pp. 46—52.
- On the chemical composition of Sponges, *Annals of Philosophy*, new ser., vol. ix, 1825, p. 431, 432.
- *British Museum Catalogues, List of British Sponges*, 1848.
- On the Genus *Hyalonema*, *Ann. Nat. Hist.*, vi, 1850, pp. 306, 307.
- On *Aphrocallistes*, a new genus of Spongiadæ from Malacca, *Proc. Zool. Soc. London*, vol. xxvi, 1858, pp. 114, 115; and *Ann. Nat. Hist.*, ser. 3, vol. ii, 1858, p. 224.
- Description of *Aphroceras*, a new genus of Calcareous Spongiadæ from Hong Kong, *Proc. Zool. Soc. London*, xxvi, 1858, p. 113; and *Ann. Nat. Hist.*, ser. 3, vol. ii, 1858, p. 83.
- Description of a new genus of Sponge *Xenospongia*, from Torres Straits, *Proc. Zool. Soc. London*, vol. xxvi, 1858, pp. 229, 230; and *Ann. Nat. Hist.*, ser. 3, vol. ii, 1858, p. 369.
- Description of *MacAndrewia* and *Myliusia*, two new forms of Sponges, *Ann. Nat. Hist.*, ser. 3, vol. v, 1860, p. 495; *Zool. Soc. Proc.*, vol. xxvii, 1859, pp. 357—361.
- Notes on the 'Glass Rope,' *Hyalonema Sieboldii*, *Ann. Nat. Hist.*, vol. xviii, 1866, pp. 287 and 485; *Proc. Zool. Soc. Lond.*,

- 1867, p. 117; Ann. Nat. Hist., vol. i, 1868, p. 292; vol. ii, 1868, p. 264; vol. iii, 1869, p. 192.
- GRAY (J. E.). On Venus' Flower-Basket (*Euplectella speciosa*), Ann. Nat. Hist., vol. xviii, 1866, p. 487.
- On *Placospongia*, a new generic form of Spongiadæ in the British Museum, Proc. Zool. Soc., 1867, p. 127.
- Notes on the arrangement of Sponges with the description of some new Genera, Proc. Zool. Soc., 1867, p. 492.
- Observations on Sponges and on their arrangement and nomenclature, Ann. Nat. Hist., 1868, vol. i, p. 161.
- Letter from, containing a reply to Dr. Bowerbank's remarks on his 'Notes on Sponges,' Proc. Zool. Soc. Lond., 1868, p. 532.
- Notes on *Theonilla*, a new genus of Coralloid Sponges from Formosa, Proc. Zool. Soc. Lond., 1868, p. 565.
- Notes on *Oeratellida*, a family of Keratose Sponges, Proc. Zool. Soc., 1868, p. 575.
- Notes on *Xylospongia Cookii*, a new genus of Palmated Sponges in the Collection of the British Museum, Proc. Zool. Soc. Lond., 1868, p. 637.
- On *Aleyonellum*, Ann. Nat. Hist., vol. ii, 1868, p. 390.
- Note on *Hyalonema boreale*, Lovén, Ann. Nat. Hist., vol. i, 1868, p. 484.
- Note on *Hyalonema Schultzei*, Semper, Ann. Nat. Hist., vol. ii, 1868, p. 373.
- On *Tetilla euplocamus* and *Hyalonema boreale*, Ann. Nat. Hist., vol. ii, 1868, p. 319.
- Note on *Janthella*, a new genus of Keratose Sponges, Proc. Zool. Soc., 1869, p. 49.
- Note on a new genus of Sponge from West Australia, Ann. Nat. Hist., ser. 4, vol. vi, 1870, pp. 272 and 346.
- Notes on Anchoring Sponges (in a letter to Mr. Moore), Ann. Nat. Hist., ser. 4, vol. vi, 1870, p. 309.
- Notes on the classification of Sponges, Ann. Nat. Hist., ser. 4, vol. ix, 1872, p. 442.
- On a new netted Sponge (*Meyerella*) from the Philippines, Ann. Nat. Hist., ser. 4, vol. x, 1872, p. 76.
- New genus of Hexradiate and other Sponges discovered in the Philippine Islands, by Dr. A. B. Meyer, Ann. Nat. Hist., ser. 4, vol. x, 1872, p. 134.

- GRAY (J. E.). On the Animal of the Glass Rope ; on the name *Tethya* and its varieties of spelling ; Marine Sponges in the British Museum, Ann. Nat. Hist., ser. 4, vol. x, 1872, p. 152.
- Notes on the siliceous spicules of Sponges, and on their division into types, Ann. Nat. Hist., ser. 4, vol. xii, 1873, p. 203.
- On two new Free Sponges from Singapore, Ann. Nat. Hist., ser. 4, vol. xi, 1873, p. 234.
- On the arrangement of Sponges, Ann. Nat. Hist., ser. 4, vol. xiv, 1874, p. 284.
- HARDWICKE (T.). Description of a Zoophyte, commonly found about the coasts of Singapore (*Spongia patera*), Asiat. Research, xi, 1822, pp. 180, 181.
- CHIAJE (S. delle). Memorie sulla storia e anatomia degli animali senza vertebre del regno di Napoli, 1823-9, Napoli.
- BELL (Thomas). Remarks on the animal nature of Sponges, Zoological Journal, vol. i, 1824, p. 202.
- GRANT (R. E.). Observations and experiments on the structure and functions of the Sponge, Edinburgh Phil. Journ., vol. xiii, 1825, pp. 94—107, 343—346 ; vol. xiv, 1826, pp. 113—124, 336—341.
- Remarks on the structure of some Calcareous Sponges, Edinb. New Phil. Jour., vol. i, 1826, pp. 166—171.
- Observations on the structure of some Siliceous Sponges, Edinb. New Phil. Jour., vol. i, 1826, pp. 341—351 ; and vol. ii, pp. 121—141.
- Notice of a New Zoophyte (*Cliona celata*) from the Firth of Forth, Edinb. New Phil. Jour., vol. i, 1826, p. 78.
- Structure and Nature of *Spongilla friabilis*, Edinb. Phil. Jour., vol. xiv, 1826, pp. 270—284.
- Notice of two new species of British Sponges (*Spongia sanguinea* and *S. cinerea*), Edinb. New Phil. Jour., vol. ii, 1827, p. 208.
- RISSE (A.). Histoire Naturelle des principales productions de l'Europe Meridionale, vol. 5, 1827, Paris.
- BOSC (L. A. G.). Histoire Naturelle des Vers, 2nd edit., 1827, Paris.
- FLEMING (J.). History of British Animals, Edinburgh, 1828.
- RASPAIL (Fr. V.). Anatomie Microscopique des *Spongilles*, Mem. Soc. d'Hist. Nat. de Paris, iv, 1828, pp. 204—237 and 246, pl. xxi ; Féruss. Bull., xiii, 1828, p. 170.

- DUTROCHET. Observations sur la *Spongilla ramosa*, Lam. (*Ephidatia lacustris*, Lamour), Ann. Sci. Nat., tom. xv, 1828, pp. 205—218.
- NARDO (G. D.). Auszug aus einem neuen System der Spongarien, Isis, 1833, p. 517.
- De Spongiis, Isis, 1831, p. 714.
- Ueber die Spongien und nachst verwandten Thiergattungen, Oken, Isis, 1833, col. 519—524.
- Ueber die Spongien und Asterien Oken, Isis, 1834, 714—717.
- Sopra un nuovo genere di Spugne, le quali perforano le pietre ed i gusci marini, Ann. Sci. Lomb., Veneto, ix, 1839, pp. 221—226.
- Sopra un nuovo genere di Spongiali Silicei intitolato *Vioa*, Venezia, 1840.
- QUOY and GAIMARD. Voyage d'Astrolabe, Paris, 1833 [contains description and figure of *Aloyoncellum speciosum*, p. 302, pl. xxvi].
- BLAINVILLE (M. D. de). Manuel d'Actinologie et de Zoophytologie, 1834-7, Paris.
- JOHNSTON (G.). On *Spongia suberea*, Loudon's Mag. Nat. Hist., vol. vii, 1834, pp. 490—492.
- List of five sponges found on North Durham Coast, Trans. Newc. Soc., vol. ii, 1838, p. 269.
- History of British Sponges and Lithophytes, London, 1842.
- Description of a new British Sponge (*Halichondria macularis*), Ann. Nat. Hist., xviii, 1846, p. 475; Berwick Nat. Hist. Club, Trans. ii, 1849, p. 196.
- GERVAIS (P.). Sur les Éponges d'eau douce, Compt. rend. Acad. Sc. Paris, tom. i, 1835, pp. 260—262.
- Neue Untersuchungen über die *Spongillen*, Fror. Not., Bd. 47, No. 1016, 1836, pp. 55, 56.
- TURPIN. Rapport sur une note de M. Fél. Dujardin relative à l'animalité des Spongilles, Compt. rend. Acad. Sc. Paris, tom. vii, 1838, p. 556.
- LAURENT (J. L. Maur). Recherches sur la *Spongille fluviatile*, Compt. rend. Acad. Sc. Paris, tom. vii, 1838, p. 617—619; tom. xi, 1840, pp. 478, 479, 693—696, and 1048—1051.
- Nature de la *Spongilla fluviatilis*, sur les corps reproducteurs de la Spongille, Paris, Soc. Philom. Proc. Verb., 1840, pp. 69—71—74.

- LAURENT (J. L. Maur). Sur les embryons ciliés et libres des *Spongilles*, Paris, Soc. Philom. Proc. Verb., 1841, pp. 73, 74.
- Zoophytologie (de "Voyage de Bonite," en 1836-7), Nouv. rech. sur l'Hydre et la *Spongille*, Paris, 1844, 8vo.
- Sur les corps reproducteurs des Éponges (*Spongia usitalissima*), Soc. Philom. Extr. Proc. Verb., 1848, pp. 40, 41, L'Institut, ix, No. 751, 1848, p. 160.
- DUJARDIN (F.). Observations sur les Éponges et en particulier sur la *Spongille* ou Éponge d'eau douce, Ann. Scienc. Natur., 2 sér., Zoologie, tom. x, 1838, pp. 5—13.
- Histoire Naturelle des Zoophytes-Infusoires, 1840, pp. 305, 306.
- MAYEN (J.). Beiträge zur näheren Kenntniss unseres Süßwasser-Schwammes (*Spongilla lacustris*), Müller's Arch. f. Anat., 1839, p. 83.
- HOGG (J.). On *Spongilla fluvialitis*, Proc. Linn. Soc., vol. i, 1839, pp. 8 and 36; 1840, p. 226; Trans. Linn. Soc. London, vol. xviii, 1841, p. 363; Charlesworth's Mag. Nat. Hist., new ser., vol. iv, 1840, p. 259.
- Remarks on the Horny Sponges with proposed divisions of the Order Spongiæ, Ann. Nat. Hist., ser. 2, vol. viii, 1842, p. 3.
- On Nardo's classification of the Spongiæ, and further notices of the *Spongilla fluvialitis*, Ann. Nat. Hist., 2 ser., vol. 7, 1851, p. 190.
- DUVERNOY (G. L.). Note sur une espèce d'Éponge qui se loge dans la coquille de l'huitre à-pied-de-cheval (*Ostrea hippopus*, Lam.) en creusant des canaux des d'épaisser des valves de cette coquille (*Spongia terebrans*), Comptes rendus, tom. ix, 1840, pp. 683—686, and 1840, pp. 1021—1023.
- BELLAMY (J. C.). Natural History of South Devon, 1840, London.
- LEREBOULLET (A.). Sur une espèce d'Éponge perforante qui occupe l'épaisseur des valves de l'Huitre comestible (*Spongia terebrans*, Duv.), L'Institut, tom. ix, 1841, p. 181.
- BIANCONI (G. G.). Sopra alcuni Zoofiti descritti sotto i nomi di *Cliona celata*, Grant, *Vioa* Nardo, e *Spongia terebrans*, Duvernoy. Estratto et osservazioni, Nuov. Ann. delle Sc. Nat. di Bologna, Anno iii, vol. vi, 1841, pp. 455—469.
- BOWERBANK (J. S.). Observations on a Keratose Sponge from Australia, Ann. Nat. Hist., vii, 1841, pp. 129—182.

- BOWERBANK (J. S.). On the Keratose or Horny Sponge of Commerce, *Micros. Journal*, vol. i, 1841, pp. 8—11; *Micros. Soc. Trans.*, vol. i, 1844, pp. 32—39.
- Descriptions of three species of Sponge, containing some new forms of organisation, *Micros. Journal*, vol. i, 1841, pp. 161, 162. *Micros. Soc. Trans.*, vol. i, 1844, pp. 63—76.
- On a new genus of Calcareous Sponges (*Dunstervillia*), *Ann. Nat. Hist.*, vol. xv, 1845, pp. 297—300.
- Observations on the Spongiadæ with descriptions of some new genera, *Ann. Nat. Hist.*, vol. xvi, 1845, pp. 400—410.
- Ciliary action in Sponges, *Trans. Micros. Soc.*, vol. iii, 1852, pp. 137—142.
- On the vital power of the Spongiadæ, *Rep. Brit. Assoc.*, 1856, pp. 438—451.
- Further Report on the vitality of Sponges, *Brit. Assoc. Report*, 1857, pp. 121—125; *Micros. Soc. Quart. Jour.*, vol. vi, 1858, pp. 78, 79.
- Anatomy and physiology of the Spongiadæ, *Proc. Royal Soc.*, vol. viii, 1857, p. 573; and *Ann. Nat. Hist.*, vol. xx (2 ser.), 1857, p. 298.
- On the anatomy and physiology of the Spongiadæ, *Philos. Trans.*, 1858, pp. 279—332, and 1862, pp. 747—836 and 1087—1135.
- On the organisation of *Grantia ciliata*, *Trans. Micros. Soc.*, new ser., vol. vii, 1859, pp. 79—84.
- A Monograph of the *Spongillidæ*, *Proc. Zool. Soc.*, 1863, pp. 440—472.
- On *Hyalonema mirabilis* in reply to Dr. Gray, *Ann. and Mag. Nat. Hist.*, vol. xviii, 1866, p. 397; *Proc. Zool. Soc.*, 1867, pp. 18 and 350.
- On *Alcyoncellum (Euplectella) speciosum*, Quoy and Gaimard, *Proc. Zool. Soc.*, 1867, p. 351; *Ann. Nat. Hist.*, ser. 4, vol. iii, p. 84.
- Observations on Dr. Gray's "Notes on the arrangement of Sponges, with the description of some new genera," *Proc. Zool. Soc. Lond.*, 1868, p. 118, and *Ann. Nat. Hist.*, ser. 4, vol. iii, p. 84.
- Monograph of the Siliceo-Fibrous Sponges, *Proc. Zool. Soc. Lond.*, 1869, pt. 1, p. 66; pt. 2, p. 323; pt. 3, 1875, p. 272; pt. 4, 1875, p. 503; pt. 5, 1875, p. 558; pt. vi, 1876, p. 535.

- BOWERBANK (J. S.). Remarks on the genus *Theonella*, Gray, Proc. Zool. Soc. Lond., 1869, p. 389.
- Report on a collection of Sponges found in Ceylon by E. W. Holdsworth, Proc. Zool. Soc. Lond., 1873, p. 25.
- Reply to Dr. J. E. Gray's observations on certain Sponges described in the Proceedings of the Zoological Society for 1873, Ann. Nat. Hist., ser. 4, vol. xii, 1873, p. 488.
- Observations on Mr. Carter's paper "On two new Sponges," &c., Ann. Nat. Hist., ser. 4, vol. x, 1872, p. 58.
- Contributions to a general history of the Spongiadæ, i—iii, Proc. Zool. Soc. London, 1872, pp. 115, 196, and 625; iv and v, 1873, pp. 3 and 333; vi, 1874, p. 298; vii, 1875, p. 582; viii, 1876, p. 768.
- Further Observations on *Alcyoncellum speciosum* and *Hyalonema mirabile*, Proc. Zool. Soc., 1875, p. 607.
- Description of five new Sponges discovered by Dr. A. B. Meyer on the Philippine Islands and New Guinea, Proc. Zool. Soc., 1877, p. 456.
- OWEN (R.). On a new genus and species of Sponge *Euplectella aspergillum*, Proc. Zool. Soc. Lond., vol. ix, 1841, p. 3; Trans. Zool. Soc. Lond., vol. iii, 1849, p. 203; also Ann. Nat. Hist., vol. viii, 1842, p. 222.
- Description of a new species of *Euplectella* (*E. cucumer*, Owen), Trans. Linn. Soc., vol. xxii, 1857, p. 117.
- STUTCHBURY (S.). Description of a new sponge from Barbadoes (*Dactylocalyx pumicea*), Proc. Zool. Soc. Lond., 1841, p. 86; Ann. Nat. Hist., vol. ix, 1842, p. 504.
- COUCH (R. Q.). Observations on the Sponges of Cornwall, Report Royal Polytechnic Soc. of Cornwall, 1842, p. 41.
- COSTA (O. G.). Fauna de Regno di Napoli-Polypi a polipario flessibili, Tethya, 1843 (contains figures and descriptions of three sponges).
- AUSTIN (Thom.). Note on Mr. Bowerbank's paper on the genus *Dunstervillia*, with remarks on *Ischadites Koningii*, the *Tentaculites*, and the *Cornularia*, Ann. Nat. Hist., vol. xv, 1845, p. 406.
- MICHELIN (H.). Note sur différentes espèces du genre *Vioa*, Revue Zool., 1846, pp. 56—61.
- EHRENBERG (C. G.). Ueber die geformten unkrystallinischen Kieseltheile von Pflanzen, besonders über *Spongilla erinaceus* in Schlesien, Berlin, Monatsber, 1846, p. 96.

EHRENBERG (C. G.). Beiträge zur Beurtheilung der wunder baren Japanischen Glaspflanze, der sogenannten Corallenthier-Gattung *Hyalonema* and der Familie der *Hyalochetiden*, Berlin, Monatsber, 1860, pp. 173—182.

— Ueber die neueren die Japanische Glaspflanze als *Spongia* betreffenden Ansichten, und Erläuterungen der Synonyme zu Hrn. Bowerbank's Spongolithen-Tafeln, Berlin, Monatsber, 1861, pp. 448—452.

— Ueber die nicht natürliche Gestaltung der Glaspflanze *Hyalonema Sieboldi*, Gray, Berlin, Monatsber, 1863, pp. 300—305.

— Ueber *Hyalonema lusitanicum*, Berlin Monatsber, 1866, p. 810, and Ann. Nat. Hist., vol. xix, 1867, p. 419.

— Weitere Entwicklung des *Hyalonema lusitanicum* und der Spongiaceen, Berlin Monatsber, 1867, p. 843.

CARTER (H. J.). Notes on the species, structure, and animality of the Fresh-Water Sponges in the tanks of Bombay, Ann. Nat. Hist., ser. 2, vol. i, 1848, pp. 303—311.

— Descriptive account of the Fresh-Water Sponges in the Island of Bombay, with observations on their structure and development, Ann. Nat. Hist., ser. 2, vol. iv, 1849, pp. 81—100.

— Zoosperms in *Spongilla*, Ann. Nat. Hist., ser. 2, vol. xiv, 1854, pp. 335, 336.

— On the ultimate structure of *Spongilla*, Ann. Nat. Hist., ser. 2, vol. xx, 1857, pp. 21—41.

— On a variety of *Spongilla Meyeni* from the River Exe, Devonshire, Ann. Nat. Hist., ser. 4, vol. i, 1868, p. 247.

— Description of a Siliceous Sand Sponge found on the South-East Coast of Arabia, Ann. Nat. Hist., ser. 4, vol. iii, 1869, p. 151.

— Descriptive account of four Subspherous Sponges, Arabian and British, with general observations, Ann. Nat. Hist., ser. 4, vol. iv, 1869, p. 1.

— On *Grayella cyathophora*, a new genus and species of Sponge, Ann. Nat. Hist., ser. 4, vol. iv, 1869, p. 189.

— Note on the Sponges *Grayella*, *Osculina*, and *Cliona*, Ann. Nat. Hist., ser. 4, vol. v, 1870, p. 73.

— On two new species of Subspherous Sponges, Ann. Nat. Hist., ser. 4, vol. vi, 1870, p. 176.

- CARTER (H. J.). On the ultimate structure of Marine Sponges, Ann. Nat. Hist., ser. 4, vol. vi, 1870, p. 329.
- On two undescribed Sponges and two *Esperiadæ* from the West Indies; also on the nomenclature of the Calcisponge *Clathrina*, Gray, Ann. Nat. Hist., ser. 4, vol. vii, 1871, p. 268.
- Account of three Pachytragous Sponges of South Coast of Devon., Ann. Nat. Hist., ser. 4, vol. vii, 1871, p. 1.
- Description of two new *Calcispongiæ*, to which is added confirmation of Professor James Clark's discovery of the true form of the Sponge-Cell Animal, and an account of the Polyp-like Pore Area of *Cliona corallinoides* contrasted with Hækel's view of the relationship of the Sponges to the Corals, Ann. Nat. Hist., ser. 4, vol. viii, 1871, p. 1.
- Parasites of the Sponges, Ann. Nat. Hist., ser. 4, vol. viii, 1871, p. 330.
- Description and illustrations of a new species of *Tethya*, with observations on the nomenclature of the Tethyadæ, Ann. Nat. Hist., ser. 4, vol. viii, 1871, pp. 99—105.
- On Fossil Sponge-Spicules of the Greensand compared with those of existing species, Ann. Nat. Hist., ser. 4, vol. vii, 1871, p. 112.
- Additional information on this structure of *Tethya dactyloidea*, Ann. Nat. Hist., ser. 4, vol. ix, 1872, p. 82.
- On two new Antarctic Sponges and New *Tethya* from Shetland, &c., Ann. Nat. Hist., ser. 4, vol. ix, 1872, p. 409.
- Observations on the reproduction of Sponges commencing from the Zygois of the Sponge Animal, Ann. Nat. Hist., ser. 4, ix, 1872, pp. 419—429.
- Proposed new name for the Sponge Animal, viz. 'Spongozoon,' and on origin of thread-cells in the Spongiadæ, Ann. Nat. Hist., ser. 4, vol. x, 1872, p. 45.
- New *Aplysina* from the North-West Coast of Spain, Ann. Nat. Hist., ser. 4, vol. x, 1872, p. 101.
- Two new Sponges from the Philippine Islands, Ann. Nat. Hist., ser. 4, vol. x, 1872, p. 110.
- Answer to Dr. Bowerbank's observations, &c., Ann. Nat. Hist., ser. 4, vol. x, 1872, p. 141.
- Description of *Labaria hemisphærica*, Gray, a new species of Hexactinellid Sponge, with observations on the Sarco-hexactinellid Sponges generally, Ann. Nat. Hist., ser. 4, vol. xi, 1873, pp. 275 and 421.

CARTER (H. J.). Points of distinction between the *Spongiadæ* and the *Foraminifera*, Ann. Nat. Hist., ser. 4, vol. xi, 1873, p. 351.

— On two new species of *Gummineæ*, with special and general observations, Ann. Nat. Hist., ser. 4, vol. xii, 1873, p. 17.

— On the *Hexactinellidæ* and *Lithistidæ* generally, and particularly on the *Aphrocallistidæ*, *Anlodictyæ* and *Furreeæ*, together with facts elicited from their deciduous structures and descriptions respectively of three new species, Ann. Nat. Hist., ser. 4, vol. xii, 1873, pp. 349 and 437.

— On the Spongozoa of *Halisarca Dujardinii*, Ann. Nat. Hist., ser. 4, vol. xiii, 1874, p. 315.

— On *Halisarca lobularis*, Schnur, off the South Coast of Devon, with observations on the relationship of the Sponges to the Ascidians and hints on their microscopy, Ann. Nat. Hist., ser. 4, vol. xiii, 1874, p. 433.

— The nature of the seed-like body of *Spongilla*; on the origin or mother-cell of the Spiculæ, and on the presence of spermatozoa in the *Spongilla*, Ann. Nat. Hist., ser. 4, vol. xiv, 1874, p. 97.

— Deep-Sea Sponges and their Spicules from the Atlantic Ocean, dredged up on board H.M.S. 'Porcupine' chiefly in 1869; with figures and descriptions of some remarkable Spicules from the Agulpas Shoal and Colon, Panama, Ann. Nat. Hist., ser. 4, vol. xiv, 1874, pp. 221 and 245, pls. xiii—xv.

— Development of the Marine Sponges from the earliest recognisable appearance of the ovum to the perfected individual, Ann. Nat. Hist., ser. 4, vol. xiv, 1874, pp. 321 and 389.

— Further instances of the Sponge-Spicule in the mother-cell, Ann. Nat. Hist., ser. 4, vol. xiv, 1874, p. 456.

— On the Genus *Rosella* (a Hexactinellid Sponge) with the descriptions of three species, Ann. Nat. Hist., ser. 4, vol. xv, 1875, p. 118.

— Notes introductory to the study and classification of the Spongida, Ann. Nat. Hist., vol. xvi, 1875, pp. 1, 126, 177, pl. iii.

— Descriptions and figures of Deep-Sea Sponges and their Spicules, from the Atlantic Ocean; dredged on board H.M.S. 'Porcupine,' chiefly in 1862, Ann. Nat. Hist., ser. 4, vol. xviii, 1876, pp. 226, 307 and 458, pls. xii—xvi.

- CARTER (H. J.). On two Vitreo-hexactinellid Sponges, *Ann. Nat. Hist.*, ser. 4, vol. xix, 1877, p. 121, pl. ix.
- Arctic and Antarctic Sponges, *Ann. Nat. Hist.*, ser. 4, vol. xx, p. 88, pl. i.
- Description of *Mauricea*, a Psammonematous Sponge (mentioned incidentally), *Ann. Nat. Hist.*, ser. 4, vol. xx, 1877, p. 174.
- Position of the Sponge-Spicule in the Spongida, and postscript on the identity of *Squamulina scopula* with the Sponges, *Ann. Nat. Hist.*, ser. 5, vol. i, 1878, p. 170.
- On *Teichonia*, a new family of Calcareous Sponges, with descriptions of two species, *Ann. Nat. Hist.*, ser. 5, vol. ii, 1878, p. 35, pl. ii.
- Parasites of the Spongida, *Ann. Nat. Hist.*, ser. 5, vol. ii, 1878, p. 157.
- On *Holastrella*, a Fossil Sponge of the Carboniferous Era, and on *Hemiastrella*, a new genus of recent Sponges, *Ann. Nat. Hist.*, ser. 5, vol. iii, 1879, p. 141, pl. xxi.
- On a new species of Excavating Sponge (*Alectona millari*), and on a new species of *Rhaphidotheca* (*R. affinis*), *Jour. Roy. Micr. Soc.*, vol. ii, 1879, p. 493, pls. xvii and xviii a.
- Contributions to our knowledge of the Spongida, *Ann. Nat. Hist.*, ser. 5, vol. iii, 1879, pp. 284 and 343, pls. xxv—xxix.
- Sponges of Kerguelen Island mentioned, *Phil. Trans.*, clxviii, 1879, p. 286.
- Report on specimens dredged up from the Gulf of Manaar, and presented to the Liverpool Free Museum by Capt. W. H. Cawne Warren, Spongida, *Ann. Nat. Hist.*, ser. 5, vol. vi, 1880, pp. 35 and 129, pls. iv—viii; and Supplementary Report, vol. vii, 1881, p. 361, pl. xviii.
- Description of two species of *Suberites* in D'Urban's *The Zoology of Barent's Sea*, *Ann. Nat. Hist.*, ser. 5, vol. vi, 1880, p. 256.
- History and classification of the known species of *Spongilla*, *Ann. Nat. Hist.*, ser. 5, vol. vii, 1881, p. 77, pls. v, vi.
- On *Spongilla cinerea*, *Ann. Nat. Hist.*, ser. 5, vol. vii, 1881, p. 263.
- Contributions to our knowledge of the Spongida, Order II, *Ceratina*, *Ann. Nat. Hist.*, ser. 5, vol. viii, 1881, p. 101, pl. ix.

- CARTER (H. J.). The development of the fibre in Spongida, Ann. Nat. Hist., ser. 5, vol. viii, 1881, p. 112, pl. ix (part).
- Contributions to our knowledge of the Spongida, Order I, *Carnosa*, Ann. Nat. Hist., ser. 5, vol. viii, 1881, p. 241.
- KOEBE (F. F. E.). *Utrum Spongiae officinalis tela fibrosa Animali an Vegetabili sit Natura*, Berolini, 1848.
- DESOR (E.). Two new Sponges (*Spongia arceolata* and *sulphurea*), Proc. Boston Soc. Nat. Hist., vol. iii, 1848, p. 67.
- HANCOCK (A.). On the excavating powers of certain Sponges belonging to the genus *Cliona*, with descriptions of several new species and an allied generic form, Ann. Nat. Hist., ser. 2, vol. iii, 1849, pp. 321—348.
- Note on the Excavating Sponges, with description of four new species, Ann. Nat. Hist., ser. 3, vol. xix, 1867, p. 229; and also Nat. Hist. Trans. Northumb. and Durham, vol. i, 1867, p. 387.
- MAYER (Père). Recherches sur l'organisation des Éponges, Compt. rend. et Mém. de la Soc. de Biologie, tom. i, 1849, p. 153.
- HUXLEY (T. H.). On the anatomy of the genus *Tethya*, Ann. Nat. Hist., ser. 2, vol. vii, 1851, p. 370.
- Manual of Anatomy of Invertebrated Animals, 1877, pp. 110—120, *Porifera*
- DOBIE (W. M.). Observations on Cilia in *Grantia*, Goodsir's Ann. of Anat. and Physiol., No. 2, 1852, pp. 127 and 129.
- STRICKLAND (H. E.). On the mode of growth in *Halichondria suberea*, Report Brit. Assoc., 1853, Trans. Soc., p. 72.
- GOSSE (P. H.). Naturalists Rambles on the Devonshire Coast, 1853 (*Grantia botryoides* and *ciliata*), pp. 234—239, pl. xv.
- Manual British Marine Zoology, 1855, ii, pp. 1—6.
- SCHAFFNER. Einige Bemerkungen über *Spongilla fluviatilis*, Verhandlung. d. Naturh. Ver. den preuss. Rhein., 12 Jahrg., 1855, p. 29.
- LEIDY (J.). On *Cliona*, Proc. Acad. Nat. Philad., vol. viii, 1856, p. 162; Sillim. Amer. Journ., 2 ser., vol. xxiii, 1857, pp. 281, 282.
- Remarks on some curious Sponges (*Hyalonema*, *Euplectella*, *Pheronema*), American Naturalist, vol. iv, p. 17.
- Remarks on Sponges, Proc. Acad. Philadelphia, 1874, p. 144.

- LIEBERKÜHN (N.). Zur Entwicklungsgeschichte der Spongillen, Müller's Archiv f. Anat., 1856, pp. 1—19, 399—414, and 496—514 (translated Ann. Nat. Hist., ser. ii, vol. xvii, 1856, pp. 403—413; and Quart. Jour. Mic. Sci., vol. v, 1857, p. 212—219).
- Beiträge zur Anatomie der Spongien, Müller's Archiv f. Anat. 1857, pp. 376—403.
- Neue Beiträge zur Anatomie der Spongien, Reichert's u. Du Bois Raymond's Archiv f. Anat., 1859, pp. 353—382, and 515—530.
- Ueber Bewegungserscheinungen bei den Schwammen, Reichert, Archiv, 1863, pp. 717—780.
- Ueber das contractile Gewebe der Spongien, Reichert u. Du Bois Raymond's Archiv, 1867, p. 74 (translated Ann. Nat. Hist., ser. 4, vol. vi, 1870, p. 497).
- BRANDT (J. F.). Symbolæ ad Polypos Hyalochæstides spectantes, 1859, folio, 4 plates (*Hyalonema*).
- VALENCIENNES (A.). Note sur les Spongiaires (*Adythia*) envoyés des côtes de l'Altique, par M. Albert Gaudry, Comp. rend., 1860, vol. li, p. 579.
- LECOQ (Henri). Observations sur une grande espèce de *Spongille* du lac Pavin, Compt. rend. Acad. Sc. Paris, tom. l, 1860, pp. 1116—1121.
- Observations sur les corps reproducteurs et sur l'état d'agregation d'une grande espèce de *Spongille* du lac Pavin (Puy de Dome), Paris, Comptes rendus, tom. l, 1860, pp. 1165—1170.
- Observations sur le degré d'animalité et sur les espèces de *Spongilles*, et particulièrement sur la grande espèce du lac Pavin, Paris, Comptes rendus, li, 1860, pp. 5, 9.
- SCHULTZE (Max S.). Ueber eine merkwürdige Spongie *Hyalonema*, Rheinl. u. Westphal. Sitzungsber., Bd. xvii, 1860, pp. 67, 69, Paris, Comptes rendus, tom. l, 1860, pp. 792, 793.
- Ueber die Japanische *Glasfadenspongie*, Rheinl. u. Westphal. Sitzungsber., Bd. xvii, 1860, p. 85.
- Ueber einen Schwamm mit Nadeln aus Hornsubstanz, Vern Nat. Ver. preuss. Rheinlande und Westph., 1865, p. 7.
- On *Hyalonema*, Archiv f. Mikrosk. Anatomie, Bd. iii, Heft 2, 1867, p. 206; and also Ann. Nat. Hist., ser. 3, vol. xix, 1867, p. 153.

- SCHMIDT (Oscar). Die Spongien des adriatischen Meeres, 1862.
 — Supplement der Spongien des adriatischen Meeres, 1864.
 — Zweites Supplement der Spongien des adriatischen Meeres, enthaltend die Vergleichung der adriatischen und britischen Spongiengattungen, 1866.
 — Spongiologische Mittheilungen, Schultze's Archiv f. Microscop. Anatomie, Bd. iii, Heft 3, 1867, p. 390.
 — Vorläufiger Bericht über die Untersuchung der Bowerbank'schen Spongien, Sitzungsab. Akad. Wiss., Wien, Band liii, p. 147.
 — Die Spongien der Küste von Algier, mit Nachträgen zu den Spongien des adriatischen Meeres, 1868.
 — Kiesel-spongien in der Zweite deutschen Nordpolarfahrt in 1869-70, Leipzig, 1874, p. 429.
 — Vorläufige Mittheilungen über die Spongien der grönländischen Küste, Mitth. des Naturw. Vereines. f. Steiermark., Bd. ii, Heft 1, 1869, p. 89.
 — Grundzüge einer Spongien-Fauna des atlantischen Gebietes, 1870.
 — Das Natürliche System der Spongien, Mittheil. der Naturwissenschaft. Vereins f. Steiermark, 1870, Band 2, Heft 2.
 — Spongien, p. 115, Zoologische Ergebnisse der Nordseefahrt vom 21 Juli bis 9 September, 1872, Berlin, 1874 (Seperatabdruck aus dem H. Jahresberichte der Kommission zur Untersuchung der deutschen Meere in Kiel).
 — Nochmals die *Gastrula* der Kalkschwämme, Archiv Mikr. Anat., Bd. xii, 1876, p. 551.
 — Das Larven-Stadium von *Ascetta primordialis* und *Ascetta clathrus*, Arch. Mikr. Anat., Bd. xiv, 1877, p. 249, pls. xv and xvi.
 — Spongien des Meerbusens von Mexico, Heft i, Jena, 4to., 1879.
 — Die Spongien des Meerbusen von Mexico (und des Caraibischen Meeres), zweites (Schluss—) Heft, 4to., 1880.
 LORENZ. Physicalische Verhältnisse und Vertheilung der Organismen im Quarnerischen Golfe, Wien, 1863.
 BALSAMO-CRIVELLI (G.). Memoria di alcuni Spongiarj del Golfo di Napoli, Atti Soc. Ital. di Sci. Nat., vol. v, 1863.
 KÖLLIKER (Albert). Ueber den Bau der Spongien, Würzburg, Naturw. Zeitschr. Bd. v, 1864 (Sitz. Ber., 1863), p. xiv.

- KÖLLIKER (Albert). *Icones Histiologicae. Erste Abtheilung, der feinere Bau der Protozoen*, 1864.
- Beltremieux. *Faune du département de la Charente-Inferieure*, 4to., 1864.
- DUCHASSAING (P.) and MICHILOTTI (G.). *Spongiaræ de la mer Caraibe, Haarlem*, 1864.
- DUCHASSAING (P.). *Revue des Zoophytes et des Spongiaires des Antilles, Paris*, 1870.
- HARTING (P.). *Bijdrage tot de kennis der microscopische fauna en flora van de Banda-Zee, Verhand. k. Akad. Wetensch., Bd. x*, 1865, p. 1.
- *Memoire sur le genre Poterion, Natur. Verhand. uitgeven door det provincial Utrechtsch Genootschap van kunsten en Wetenschappen, Bd. ii*, 1870, p. 2.
- CLARK (H. J.). *Conclusive proofs of the animality of the Ciliate Sponges, and of their affinities with the Infusoria flagellata, Amer. Jour. Sci., 2nd series, Nov., 1866, p. 320, and Ann. Nat. Hist., ser. 3, vol. xix, 1867, p. 13.*
- *On the Spongia ciliata as Infusoria flagellata; or observations on the structure, animality and relationship of Leucosolenia botryoides, Bowerbank, Memoirs Boston Soc. of Nat. Hist., vol. i, part 3, p. 305; and also Ann. Nat. Hist., ser. 4, vol. i, 1868, pp. 133, 188, and 250.*
- *Note on the Infusoria flagellata and the Spongia ciliata, Amer. Jour. Science, ser. 3, vol. i, 1871, p. 113, and vol. ii, p. 426; also Ann. Nat. Hist., ser. 4, 1871, vol. vii, p. 247.*
- *The American Spongilla a Craspedote Flagellate Infusorian, Amer. Jour. Sci., ser. 3, vol. ii, 1871, p. 427; Ann. Nat. Hist., ser. 4, vol. ix, 1872, p. 71; Month. Micros. Journal, vii, 1872, p. 104, pl. xi.*
- HÄCKEL (E.). *Generelle Morphologie der Organismen, Bd. ii*, 1866, p. 29.
- *Ueber den Organismus der Schwämme und ihre Verwandtschaft mit den Corallen, Jenaische Zeitschrift, Bd. v, 1869, pp. 207—254, translated Ann. Nat. Hist., ser. 4, vol. v, 1870, pp. 1—13 and 107—120.*
- *Prodromus eines Systems der Kalkschwämme, Jenaische Zeitschrift, Bd. v, 1869, p. 236, translated Ann. Nat. Hist., ser. 4, vol. v, 1870, pp. 176—191.*

- HÄCKEL (E.). Ueber die sexuelle Fortpflanzung und das natürliche System der Schwämme, *Jenaische Zeitschrift für Med. und Naturwiss.*, Bd. vi, 1871, pp. 641—651.
- Die Kalkschwämme, eine Monographie, 3 vols., 4to., 1872.
- Kalk und Gallertsporgien. Die zweite deutsche Nordpolarfahrt in 1869-70, Leipzig, 1874, p. 434.
- Die Physemarien (*Haliphysema* und *Gastrophysema*), Gasträden der Gegenwart, *Jenaische. Zeitschr.*, xi, 1876, pp. 1—54, pls. i—vi (Biologische Studien, ii, Studien zur Gastroæ-Theorie, 1877).
- SEMPER (C.). Einige Worte über *Euplectella aspergillum* und seine Bewohner, *Archiv f. Naturg. Jahrg.*, xxxiii, 1867, i, Heft i, p. 84.
- SELENKA (Emil). Ueber einige neue Schwämme aus der Südsee, *Zeitschr. f. Wissensch. Zoologie*, Bd. xvii, 1867, p. 565.
- Ueber einen Kieselschwamm von achtstrahligem Bau, und über Entwicklung der Schwammknospen, *Zeit. Wiss. Zool.*, Bd. xxxiii, 1879, p. 467, pls. xxvii, xxviii.
- BOCAGE (J. V. B. du). On *Hyalonema lusitanicum*, *Ann. Nat. Hist.*, ser. 3, vol. xx, 1867, p. 123.
- Notes on *Hyalonema boreale* and on a new genus of Sponge, *Ann. Nat. Hist.*, ser. 4, vol. ii, 1868, p. 36.
- Eponges siliceuses nouvelles de Portugal et de l'île Saint Jago (Archipel de Cap-Vert), *Journ. des Scien. Math. Phys. et Natur. Lisbonne*, 1869, No. 4, p. 159, 2 plates.
- Sur l'existence de la *Holtenia Carpenteri*, Wyville Thomson, dans les côtes du Portugal, *Jornal de Scientias de Academia Real de Lisbon*, 1870, p. 79.
- CLAUS (C.). Ueber *Euplectella aspergillum*, Owen, ein Beitrag zur Naturgeschichte der Kieselschwämme Marburg, 1868, 4to., 4 plates.
- *Traite de Zoologie*, 1878 (troisième édition), tom. i, pp. 159—169.
- PARFITT (Edward). On the Marine and Fresh-Water Sponges of Devonshire, *Trans. Devonshire Assoc. Advanc. Science, Literature and Art*, 1868.
- THOMSON (Wyville). On the Vitreous Sponges, *Ann. Nat. Hist.*, ser. 4, vol. i, 1868, p. 114.
- On the depths of the Sea (contains illustration of *Holtenia Carpenteri*), *Ann. Nat. Hist.*, ser. 4, vol. iv, 1869, p. 112.

- THOMSON (Wyville). On *Holtenia Carpenteri*, a new genus and species of Vitreous Sponges, Proc. Royal Soc., June 17th, 1869; Phil. Trans., 1869, p. 701, pls. lxxvii—lxxxi; abstract in Ann. Nat. Hist., ser. 4, vol. iv, 1869, p. 284.
- The Depths of the Sea, London, 1873.
- Voyage of the 'Challenger,' The Atlantic, 1877, 2 vols.
- MARTENS (E. von). Ein Süßwasserschwamm aus Borneo, Archiv. f. Naturg., 1868, Bd. xxxiv, p. 61.
- HEBKLOTS (J. A.) and MARSHALL (W.). Notice sur deux espèces nouvelles d'Eponges de la Famille des *Lophospongiæ*, Archives Néerlandaises, tom. iii, 1868, 5me Liv., p. 435.
- LOVÉN (S.). Om en märklig i Nordsjön lefvande Art af Spongia Öfvers. af k. Vet. Akad. Forhand., 1868, p. 105; also Ann. Nat. Hist., vol. ii, 1868, p. 81.
- WRIGHT (E. Percival). Notes on Irish Sponges (52 species), Proc. Royal Irish Academy, vol. x, 1868, p. 221.
- Note on *Hyalonema*, Ann. Nat. Hist., ser. 4, vol. ii, 1868, p. 320.
- Notes on Deep-Sea Dredging off the coast of Portugal, Ann. Nat. Hist., ser. 4, vol. ii, 1868, p. 423.
- Notes on Sponges. 1. *Hyalonema mirabilis*, Gray. 2. *Aprocallistes Bocagei*, n. sp. 3. On a new genus and species of Deep-Sea Sponge [*Wyvillethomsonia Wallichii*], Quart. Jour. Mic. Sci., 1870, p. 73.
- On a new genus and species of Sponge [*Kallispongia Archeri*], Proc. Roy. Irish Acad., ser. 2, vol. ii, p. 754, pl. xl.
- On a genus and species of Sponge (*Alema Seychellensis*), with supposed Heteromorphic Zoids, Trans. Royal Irish Acad., vol. xxviii, 1881, p. 13, pl. i.
- FISCHER (P.). Recherches sur les Éponges perforantes fossiles (*Oliona*), Nouvelles, Arch. du Mus., tom. iv, 1868, pp. 117—170, pls. xxiv, xxv.
- MICKLUCHO-MACLAY (N.). Beiträge zur Kenntniss der Spongien, Jenaische Zeits. f. Med. u. Natur. Wiss., Bd. iv, 1868, pp. 221—240, pls. iv, v.
- Ueber einige Schwämme des nördlichen stillen Oceans und des Eismeereres, ein Beitrag zur Morphologie und Verbreitung der Spongien, Mém. de l'Acad. impér. des Sci. de St. Petersburg, 1870.

- MICKLUCHO-MACLAY (N.). Bemerkungen zur Schwamm-Fauna des Weissen Meeres und des arktischen Oceans, Bull de la Classe Phys-Mathém. de l'Acad. de St. Petersbourg, 1870, p. 208.
- NORMAN (A. M.). Last Report on Dredging among the Shetland Isles, Report Brit. Assoc. for 1868, p. 327.
- Notes on a few Hebridean Sponges and on a new species of *Desmacidon* from Jersey, Ann. Nat. Hist., ser. 4, vol. iii, 1869, p. 296.
- Submarine-Cable Fauna, Ann. Nat. Hist., ser. 4, vol. xv, 1875, p. 176.
- On the genus *Haliphysema*, with description of several forms apparently allied to it, Ann. Nat. Hist., ser. 5, vol. ii, 1878, p. 264, pl. xvi.
- Notes on the French exploring Voyage of "Le Travailleur" in the Bay of Biscay (contains names only of a few Sponges), Ann. Nat. Hist., ser. 5, vol. vi, 1880, p. 430; and Brit. Assoc. Report, 1880, p. 387.
- MOORE (T. J.). On the habits of the Regadera (watering-pot) or Venus's flower-basket (*Euplectella aspergillum*), Ann. Nat. Hist., ser. 4, vol. iii, 1869, p. 196.
- VAILLANT (L.). Note sur la vitalité d'une Éponge de la famille des Corticates la *Tethya lyncurium*, Lamk., Compt. rend., tom. lxxiii, 1869, p. 86; and Ann. Nat. Hist., ser. 4, vol. iii, p. 172.
- Note sur la disposition des pores ou orifices afférents dans la *Cliona celata*, Compt. rend. de l'Acad. Sci., tom. lxx, 1870, p. 41; translated Ann. Nat. Hist., ser. 4, vol. v, 1870, p. 146.
- KENT (W. S.). Notice of a new vitreous sponge, *Phoronema (Holtenia) Grayi*, Ann. Nat. Hist., ser. 4, vol. vi, 1870, p. 182.
- On two Siliceous Sponges taken in the late Dredging Expedition of the yacht "Norna" off the coasts of Spain and Portugal, Ann. Nat. Hist., ser. 4, vol. vi, 1870, p. 217.
- On the *Hexactinellidæ* or hexradiate spiculed Siliceous Sponges taken in the "Norna" Expedition off the coasts of Spain and Portugal, Monthly Micros. Journal, 1870, p. 241, pls. lxiii—lxv.
- Häckel on the relationship of the Sponges to the Corals, Ann. Nat. Hist., ser. 4, vol. vi, 1870.

- KENT (W. S.). Häckel and E. R. Lankester on the affinities of the Sponges, *Ann. Nat. Hist.*, ser. 4, vol. vii, 1870.
- On a new Anchoring Sponge, *Dorvillia agariciformis*, *Monthly Micros. Journal*, 1870, p. 293.
- Note on *Dorvillia agariciformis*, *Ann. Nat. Hist.*, ser. 4, vol. vii, 1871, p. 37.
- On a new genus of Sponges (*Caulospongia*) from North Australia, *Proc. Zool. Soc. London*, 1871, p. 616.
- Note on *Tethys muricata*, Bow., and *Dorvillia agariciformis*, Kent, *Ann. Nat. Hist.*, ser. iv, vol. x, 1872, p. 209.
- Note on *Haliphysema*, *Ann. Nat. Hist.*, ser. 4, vol. xx, 1877, p. 448.
- A new field for the Microscope, *Pop. Science Review* (n. s.), vol. ii, 1878, p. 113, pls. iii, iv.
- Notes on the embryology of Sponges, *Ann. Nat. Hist.*, ser. 5, vol. ii, 1878, pls. vi, vii.
- Observations on Haeckel's group of the *Physcmaria* and of their affinity with the Sponges, *Ann. Nat. Hist.*, ser. 5, vol. i, 1878, p. 1.
- The Foraminiferal nature of *Haliphysema Tumanowiczii*, Bow. (= *Squamulina scopula*, Carter), demonstrated, *Ann. Nat. Hist.*, ser. 5, vol. ii, 1878, p. 68.
- Manual of the Infusoria: including a description of all known Flagellate, Ciliate, and Tentaculiferous Protozoa, British and Foreign, and an account of the organisation of the Sponges, 4to., London, 1880-1.
- STEWART (C.). On a new Sponge *Tethyopsis columnifer*, *Quart. Jour. Micr. Sci.*, 1870, p. 281.
- VERBILL (A. E.). Records three Calcareous and fourteen Siliceous Sponges from shores of New England in 'Report on the condition of the Sea Fisheries on the South Coast of New England in 1871 and 1872,' Washington, 1873.
- Preliminary Check-List of the Marine Invertebrata of the Atlantic Coast from Cape Cod to the Gulf of St. Lawrence, New Haven, 1879; also id. in *P. U. S., Nat. Mus.*, 1879, Porifera of the north-east coast of America (includes more than 100 species of Sponges, with *Oladorrhiza grandis*, sp. n., from Nova Scotia).
- Notice of recent additions to the Marine Invertebrata of the north-eastern coast of America, with descriptions of new

- genera and species, and critical remarks on others, Proc. Unit. Stat. Nat. Mus., ii, 1880, p. 165.
- PAGENSTECHER (H. A.). Zur Kenntniss der Schwämme, Verhand. des Naturhist. Medic. Vereins in Heidelberg, 1871, vol. vi, p. 1.
- EHLERS (E.). Die Esper'schen Spongien in den Zoologischen Sammlung der k. Universität, Erlangen, 1870 (University Programme).
- On a new form of Sponge (*Aulorhipis elegans*), Zeits. für wissenschaftliche Zoologie, Bd. xxi, 1871, p. 540; and Ann. Nat. Hist., ser. 4, vol. vii, 1871, p. 302.
- FUNCK (N.). Publicat. L'Institut Roy. de Luxembourg, Section des Sci. Nat. et Mathem, tom. x, 1871, p. 266.
- GRUBE (E.). Jahresb. des schles. Gesells. f. vaterlandsche Cultur, Bd. xlvii, p. 45.
- Bericht Schlesischen Gesellsch., 1872, p. 62 (*Spongia Baicalensis*, Pall.).
- Mittheilungen über St. Malo und Roscoff und der Meeresfauna, Breslau, 1873.
- FLEMING (W.). Verhand. der physik. medic. Gesells. in Würzburg, n. s., Bd. ii, 1871, p. 1.
- MOULINS (C. des). Questions obscures relatives à l'*Hydractinea echinata*, Flem., et à l'*Alcyonium domuncula*, Lamk., tous deux logeurs de Pagures. § 2. *Alcyonium domuncula*, Actes de la Soc. Linn. de Bordeaux, tom. xxviii, 1872, p. 342.
- SARS (G. O.). On some remarkable forms of Animal Life from the great deeps off the Norwegian coast, i, 1872, Christiania (University Programme).
- MÖBIUS (K.). (Die wirbellosen Thiere der Ostsee.) Bericht über die Expédition zur physikalischchemischen und biologischen Untersuchung der Ostsee im Sommer, 1871, auf S. M. Aviso-dampfer Pommerania, Kiel, 1873.
- Beiträge zur Meeresfauna der Insel Mauritius und der Seychellen-Foraminifera, 4to., 1880 [*Halysphysema*].
- EIMER (T.). Nesselzellen und Saamen bei Seeschwämmen, Arch. Mikr. Anat., Bd. viii, 1872, p. 281; also Ann. Nat. Hist., ser. 4, vol. x, 1872, p. 306.
- ECKHEL (G. v.). Der Badeschwamm in Rücksicht auf die Art seiner Gewinnung, die geographische Verbreitung und lokale Variation, Triest, 1873.

- HIGGIN (T.). On the structure of the skeleton of *Euplectella aspergillum*, Ann. Nat. Hist., ser. 4, vol. xiii, 1874, p. 4.
- On two Hexactinellid Sponges (*Hyalonema cebutense* and *Labaria hemispharica*) from the Phillipine Islands, in the Liverpool Free Museum, with remarks by H. J. Carter, Ann. Nat. Hist., ser. 4, vol. xv, 1875, p. 377.
- On a new Sponge of the genus *Luffaria*, from Yucatan, in the Liverpool Free Museum, Ann. Nat. Hist., ser. 4, vol. xvi, 1875, p. 223.
- Description of some Sponges obtained during a cruise of the Steam Yacht "Argo," &c., Ann. Nat. Hist., ser. 4, vol. xix, p. 291, pl. xiv.
- Sponges, their anatomy, physiology and classification, Proc. Liverpool Soc., xxix, 1875, p. 193, pls. i—iii.
- LANKESTER (E. R.). The mode of occurrence of Chlorophyll in Spongiadæ, Quart. Jour. Micros. Sci., vol. xiv, 1874, p. 400.
- The structure of *Haliphysema Tumanowiczii*, Quart. Jour. Mic. Sci., new series, xix, pp. 475—482, pl. xii.
- HADLOW (H.). The *Hyalonema mirabilis*, Tr. A. S. Japan for 1872-3, 1874, p. 10.
- METSCHNIKOFF (Ellias). On the development of the *Calcispongia*, Zeitschrift für wissenschaftliche Zoologie, Band xxiv, 1874, pp. 1—14, pl. i, translated Ann. N. Hist., ser. 4, vol. xvi, p. 41.
- Beiträge zur Morphologie der Spongien, Zeits. wiss. Zool., xxvii, 1876, p. 275 (Archiv Z., expér. v, 1876, p. 357).
- Researches respecting Sponges, Mém. Soc. Nouv., Russ. iv, [in Russian].
- Spongiologische Studien, Zeits. wiss. Zool., xxxii, 1879, p. 349, pls. xx—xxiii.
- SMITH (S. J.) and HARGER (O.). Report on the Dredgings in the region of St. George's Banks in 1872, Trans. Connect. Acad. Sci., iii, 1874, p. 55, pl. vii, fig. 1.
- McINTOSH (W. C.). Spongiadæ of St. Andrew's, Ann. Nat. Hist., ser. 4, vol. xiii, 1874, p. 142.
- The Marine Invertebrates and Fishes of St. Andrew's, Edinburgh, 1875 [contains list of ten species].
- KELLER (C.). Remarks on three layers in Sponges, Verh. Naturf. Gesells., Zürich, 1875-6, p. 68.

- KELLER (C.). Untersuchungen über die Anatomie und Entwicklungsgeschichte einiger Spongien des Mittelmeeres, ein Beitrag zur Lösung der Spongienfrage, Basel, 1876.
- Ueber den Bau von *Raniera semitubulosa*, O. S., ein Beitrag zur Anatomie der Kiesel Schwämme, Zeits. wiss. Zool., xxx, 1877, p. 568, pls. xxxvi and xxxvii.
- Ueber Spermaabildung bei *Spongilla*, Zool. Anzeiger, 1878, No. 14, pp. 814, 815.
- Studien über Organisation und Entwicklung der *Chalineen*, Zeits. wiss. Zool., xxxiii, 1879, p. 317, pls. xviii—xx; also preliminary notice, Zool. Anz., ii, p. 303.
- Neue Cœlenteraten aus dem Golf von Neapel, Arch. Mikr. Anat., xviii, 1880, p. 271, pls. xiii, xiv.
- On the systematic position of the Sponges, Ann. Nat. Hist., ser. 5, vol. v, 1880, p. 268 (a short abstract).
- LÜTKEN (C.). Catalogue of Spongozoa, p. 190, Manual Nat. Hist., Geology and Physics of Greenland, edited by Prof. T. R. Jones, 1875.
- SORBY (H. C.). On the chromatological relations of *Spongilla fuviatilis*, Quart. Jour. Mic. Sci., xv, 1875, pp. 47—52.
- MARSHALL (W.). Untersuchungen über *Hexactinelliden*, Zeits. wiss. Zool., xxv, 1875, p. 142, pls. xi—xvii.
- Ideen über die Verwandtschaftsverhältnisse der Hexactinelliden, Zeits. wiss. Zool., xxvii, 1876, p. 114.
- Untersuchungen über *Dysideiden* und *Phoriospongien*, Zeit. wiss. Zool., xxxv, 1880, p. 88, pls. vi—viii.
- and MEYER (A. B.). Ueber einige neue und wenig bekannte Philippinische *Hexactinelliden*, Mittheil. Mus. Dresden, ii, 1879, p. 261, pls. xxiv, xxv.
- FOREL (F. A.). Matériaux pour servir à l'étude de la faune profonde du Lac Lemman, Geneva, 1876, p. 204 (*Spongilla lacustris*).
- SCHULZE (F. E.). Ueber den Bau und die Entwicklung der Spongien. 1. *Sycandra raphanus*, Haeckel, Zeits. wiss. Zool., xxv (Supp.), 1875, p. 247, pls. xviii—xxi.
- Zur Entwicklungsgeschichte von *Sycandra*, Zeits. wiss. Zool., xxvii, 1876, p. 486.
- Untersuchungen über den Bau und die Entwicklung der Spongien; die Gattung *Halisarca*, Zeits. für wiss. Zool., xxviii, 1877, p. 1.

- SCHULZE (F. E.). Untersuchungen, &c., die Familie der *Chondrosida*, Zeits. für wiss. Zool., xxix, 1877, p. 82, pls. viii and ix.
- Untersuchungen, &c., 4te Mitth., die Familie der *Aplysinida*, Zeits. wiss. Zool., xxx, 1878, p. 379, pls. xxi—xxiv.
- Untersuchungen, &c., 5te Mitth., die Metamorphose von *Sycandra raphanus*, Zeits. wiss. Zool., xxx, 1878, p. 261, pls. xviii, xix.
- Untersuchungen, &c., 6te Mitth., die Gattung *Spongelia*, Zeits. wiss. Zool., xxxii, 1878, p. 117, pls. v—viii.
- Untersuchungen, &c., 7te Mitth., die Familie der *Spongida*, Zeits. wiss. Zool., xxxii, 1879, p. 593, pls. xxiv—xxviii.
- Untersuchungen, &c., 8te Mitth., die Gattung *Hircinia*, Nardo, und *Oligoceras*, n. g., Zeits. wiss. Zool., xxxiii, 1879, p. 1, pls. i—iv.
- On the structure and arrangement of the soft parts in *Euplectella aspergillum*, Trans. Roy. Soc. Edinb., xxix, 1880, p. 661, pl. xvii.
- Untersuchungen, &c., 9te Mitth., die *Plakiniden*, Zeits. wiss. Zool., xxxiv, 1880, p. 707, pls. xx—xxii.
- Untersuchungen, &c., 10te Mitth., *Corticium candelabrum*, O. Schmidt, Zeits. wiss. Zool., xxxv, 1881, pp. 410—430, pl. xxii.
- BARROIS (C.). Mémoire sur l'embryologie de quelques Éponges de la Manche, Ann. Sci. Nat., ser. 6, iii, 1876, art. xi, pls. xii—xvi (abstr. Month. Mic. Jour., xvi, 1876, p. 254).
- PAYER (Julius). Incidental notice of occurrence of *Hyalonemata*, Austrian Arctic Voyage, London, 1876, vol. ii, p. 93, and fig.
- FULLAGAR. Note on the development of the Spicules of *Spongilla fluviatilis*, Month. Micros. Jour., xviii, 1877, p. 45.
- GRIMM (E. O.). Description of new Sponges discovered during his Aral and Caspian researches, Aralo-Caspian Researches, vol. ii (St. Petersburg. In Russian). (a) Tetrad, i, 1876, p. 80, pls. ii and iii. (b) Tetrad, ii, 1877, p. 29, pl. ix, figs. 1—6.
- WALLER (J. G.). On a new British Sponge of the genus *Microciona*, Month. Micros. Journ., xviii, 1877, p. 261.
- On variation in *Spongilla fluviatilis*, Jour. Queckett Mic. Club, No. 37, 1878, p. 53, pl. v.

MURIE (J.). On Steere's Sponge, a new genus of the *Hexactinellid* group of the Spongida, Trans. Lin. Soc., ser. ii, vol. i, 1877, p. 219, pls. xxxvi and xxxvii.

SCHUFFNER (Oscar). Beschreibung einiger neuer Kalkschwämme, Jenaische Zeits. für Med. u. Naturwiss., xi, p. 403, 1877, pls. xxiv—xxvi.

HYATT (A.). Revision of the North American Porifera, with remarks upon foreign species, pt. ii, Mem. Boston Soc., ii, p. 481, pls. xvi and xvii, 1877.

— On the Embryology of Sponges, Proc. Boston Soc., vol. xix, 1877, p. 12.

— Guides for Science Teaching, No. 3, Commercial and other Sponges, 1880.

DYBOWSKI (W. M.). Ueber die *Spongillen* der Ostseeprovinzen, Sitzungsbe. der Dorpater Naturf. Gesell., 104te Sitzung, an Nov. 17, 1877, Beiträge zur balt. Wochenschrift, 1878, No. 4, 26 Jan., pp. 10—12.

— Mittheilungen über Spongien (*Spongilla*, &c.), i, ii, Zoolog. Anzeiger., i, 1878, pp. 30 and 53.

— Studien über die Spongien des Russischen Reiches, mit besonderer Berücksichtigung der Spongien-fauna des Baikal-Sees, Mem. Acad. Imp. Sci., St. Petersbourg, ser. 7, xxvii, 1880, No. 6.

— Ueber *Lubomirskia baicalensis* u. äb. d. Verbreit. d. Baikal-schwämme im Allgem., 1881.

SOLLAS (W. J.). On the changes produced in the Siliceous Skeletons of certain Sponges by the action of Caustic Potash, Ann. Nat. Hist., ser. 4, vol. xx, 1877, p. 285, pl. ix.

— On two new and remarkable species of *Cliona*, Ann. Nat. Hist., ser. 5, i, 1878, p. 54, pls. i, ii.

— On *Plectonella papillosa*, a new genus and species of Echinonematous Sponge, Ann. Nat. Hist., ser. 5, iii, 1879, p. 17, pls. iv—vii.

— On *Pharetronema zingiberis*, a new genus and species of Renierid Sponge, Ann. Nat. Hist., ser. 5, iii, 1879, p. 404, pl. xxx.

— On *Plocamia plena*, a new species of Echinonematous Sponge, Ann. Nat. Hist., ser. 5, iv, 1879, p. 44, pls. vi, vii.

— The Sponge-Fauna of Norway, a report on the Rev. A. M. Norman's collection of Sponges from the Norwegian Coast,

- Ann. Nat. Hist., ser. 5, v, 1880, pp. 130, 241, and 396, pls. vi, vii, x—xii, xvii.
- ZITTEL (K. A.). Studien über fossile Spongien, erste Abtheilung. I. *Hexactinellida*, Abh. bayer Akad. d. Wiss., xiii, 1878, p. 1, translated Ann. Nat. Hist., ser. 4, xx, 1877, pp. 256, 405, and 501.
- Studien, &c. II. *Lithistida*, Abh. bayer Akad. d. Wiss., ii, cl. xiii, 1878, p. 67, pls. i—x, translated Ann. Nat. Hist., ser. 5, ii, pp. 112, 235, 324, 385, 467, pl. viii (contains recent species).
- Studien, &c. III. Abt. *Monactinellida*, *Tetractinellida*, and *Calcispongiae*, Arb. bayer. Akad. d. Wiss., xvii, 1879, pt. 2, p. 1, pls. xi, xii, translated Ann. Nat. Hist., ser. 5, iii, 1879, pp. 304 and 364; iv, 1879, pp. 61 and 120.
- Beiträge zur Systematik der Fossilen Spongien, Stuttgart, 1879.
- COUES (E.) and YARROW (H. C.). In notes on the Natural History of Fort Macon, N. C., and vicinity, Proc. Acad. Philadel., 1878, p. 297.
- CZERNIAVSKY (V.). Littoral Sponges of the Black and Caspian Seas, an introductory investigation [in Russian], Bull. Soc. Imp. des Natur. Moscou, liii, 1878, p. 375, pls. v—viii.
- Spongiæ littorales Marium Pontici et Caspii [in Russian, description of Species in Latin], Bull. Soc. Imp. Nat. Moscou, liv, 1880, pt. ii, pp. 88, 228.
- MERESCHKOWSKY (C.). On *Wagnerella*, a new genus of Sponge, nearly allied to the *Physemaria* of Ernst Hæckel, Mém. Acad. Imp. des Scien. Petersbourg, ser. 7, xxvi, No. 7, 1878, p. 15, pl. ii, figs. 1—5; and Ann. Nat. Hist., ser. 5, i, 1878, p. 70, pl. v (*not a sponge*); Note on *Wagnerella* a Protozon, Ann. Nat. Hist., ser. 5, vol. viii, 1881, p. 288.
- Études sur les Éponges de la Mer Blanche, Mém. Acad. Imp. des Scienc., Petersbourg, ser. 7, xxvi, No. 7, 1878, p. 1, pls. i—iii.
- Reproduction des Éponges par bourgeonnement extérieur, Arch. de Zool. expér. et génér., viii, 1880, p. 117, pl. xxxi; reported and figures given also Jour. Roy. Micros. Soc., iii, p. 970, pl. xxi.
- GANTIN (M.). Zur Entwicklung der *Spongilla fluviatilis*, Zoolog. Anzeiger, i, 1878, p. 195.

- GANIN (M.). Materialien zur Kenntniss des Baues und der Entwicklung der Schwämme [in Russian], Warsaw, 1879.
- BROTHERUS. A paper on *Spongilla*, Meddelanden af Soc. pro Fauna et Flora Fennica., iii, 1878, p. 168.
- DAWSON (G. M.). On some Canadian species of *Spongilla*, Canadian Naturalist, n. s., viii, 1878, p. 1.
- MARENZÜLLER (E. von). Die Coelenteraten, Echinodermen, und Würmer der k. k. Oesterreichisch-ungarischen Nordpol-Expedition, Denk. d. k. Akad. Wissens. zu Wien, xxv, 1878, p. 357, pls. i—iv.
- Die Aufzucht des Badeschwammes aus Theilstücken, Verhand. d. k. k. Zool. Bot. Gesell., Wien, 1878.
- DESZO (P.). Die Histiologie und Sprossenentwicklung der *Tethyen*, besonders der *Tethya lyncurium*, Lieberkühn (auctorum), Arch. Mikr. Anat., xvi, 1879, p. 626, pls. xxx—xxxii.
- A Magyar tengerpart Szivacsfaunája. I. Kozlemený, Ectezeszek a Természettudományok, köveböl x, kotet xiii, Szam, 1880.
- KRUKENBERG (C. F. W.). Verdauung der Spongien, Vergleich. physiolog. Studien an den Küsten der Adria, Heidelberg, 1879.
- Tetronerythrin in Schwämmen, Centralbl. med. Wissensch., 1879, No. 40.
- VOSMAER (G. C. J.). The Sponges of the Leyden Museum. I. The Family of the *Desmacidinae*, Notes Leyden Mus., ii, 1880, p. 99.
- DUNCAN (P. M.). On a Parasitic Sponge of the order *Calcarea*, Jour. Roy. Mic. Soc., iii, 1880, p. 377, pl. x.
- RIDLEY (S. O.). Two cases of incorporation by Sponges of spicules foreign to them, Lin. Soc. Jour. Zoology, xv, 1880, p. 149.
- On *Plocamia* (= *Dirrhopalum*) and other Sponges of the Order *Echinonemata*, Linn. Soc. Jour. Zoology, xv, 1881, p. 476, pls. xxviii, xxix.
- Zoological Collections of H.M.S. "Alert," Straits of Magellan and Patagonia Spongida, Proc. Zool. Soc., 1881, p. 107, pls. x, xi.
- Polyzoa, Cœlenterata and Sponges of Franz-Joseph Land (*Clathrina coriacea*, the only sponge mentioned), Ann. Nat. Hist., ser. 5, vii, 1881, p. 442.

- POTTS (E.). New genera and forms of Fresh-Water Sponges, Proc. Acad. Nat. Sci. Philadelphia, June 14th, 1881, and July 26th, 1881, p. 176; also Ann. Nat. Hist., ser. 5, viii, 1881, pp. 387, 389.
-

- NOZEMAN (C.). Over de inlandische Zoetwater Spongie, Haarlem, 4to., 1788.
- SAVIGNY (J. C.). Description de l'Egypte, Iconographie, Paris, fol. max., 1810, Zoophytes, pls. 1—3.
- BERTOLONI (A.). Sopra alcune produx. nat. (*Spongitarii*) nel golfo della Spezia, Modena, 1832, 4to. 1 plate.
- MILNE-EDWARDS (H.). Cuvier, Règne Animal (edit. Masson), 1850, Zoophytes, pl. 95.
- THOMPSON (W.). Natural History of Ireland, vol. iv, 1856, pp. 480—484 (List of Irish Sponges).
- GREENE (J. R.). Manual of the Protozoa, 1859, pp. 30—43 (woodcuts).
- CHIMMO (W.). Natural History of the *Euplectella aspergillum*, 1878, 6 plates.
- BALFOUR (F. M.). On the Morphology of the Spongida, Quart. Journ. Micros. Science, vol. xix, 1879, p. 103.



APPENDIX.

BRITISH SPONGES NOT REFERRED TO IN THE FOREGOING WORK BY DR. BOWERBANK.

A. CALCAREOUS SPONGES OF ERNST HAECKEL.

HAECKEL, in his Monograph, 'Die Kalkschwämme,' enumerates and describes the following calcareous sponges as members of the British Fauna. Of course the generic names which he employs cannot in many instances be retained by biologists, but must give place to genera of earlier date. The localities appended are those from which Haeckel has examined specimens.

1. ASCETTA CORIACEA (*Montagu*).

Ascetta coriacea, Haeckel. L. c., p. 24, pls. iii and v, figs. 2a—2c.

Leucosolenia coriacea, Bow. et auctorum.

Clathrina sulphurea, Carter. Ann. Nat. Hist., ser. 4, vol. vii (1871), p. 278.

Habitat.—Shetland (Norman), Berwick Bay (Johnston), Great Cumbrae (Frauenfeld), Scarborough (Bean), Peterhead (Peach), Budleigh-Salterton (Carter), Dublin Bay (Hassall), Belfast (Percival Wright), Lough

Strangford (Norman), Bantry (Norman), Guernsey (Buckland), Sark (Bowerbank).

Geographical Range.—Norway, Normandy.

2. *ASCALTIS BOTRYOIDES* (*Ellis and Sol.*).

Ascaltis botryoides, Haeckel. L. c., p. 65, pl. ix, fig. 10; pl. x, figs. 7 a—7 e.

Leucosolenia botryoides, Bow.

Habitat.—Berwick Bay (Johnston, in Mus. Normani), Tenby (Bowerbank), Portrush (Percival Wright).

Geographical Distribution.—Atlantic coasts of Europe.

3. *ASCORTIS LACUNOSA* (*Bean*).

Ascortis lacunosa, Haeckel. L. c., p. 70, pl. xi, fig. 2; pl. xii, figs. 2 a—2 h.

Leucosolenia lacunosa, Bowerbank.

Habitat.—Scarborough (Bean, in Mus. Normani), Belfast Lough (Hyndman), Shetland (Peach).

4. *ASCANDRA CONTORTA* (*Bow.*).

Ascandra contorta, Haeckel. L. c., p. 91, pl. xiv, figs. 6 a—6 c.

Leucosolenia contorta, Bowerbank.

Habitat.—Guernsey (Buckland), Sark (Bowerbank).

5. *ASCANDRA COMPLICATA* (*Montagu*).

Ascandra complicata, Haeckel. L. c., p. 93, pl. xv, figs. 1 a—1 k.

Grantia botryoides, Lieberkühn, Archiv f. Anat. u. Phys., 1859, p. 373; 1865, p. 735, pl. xix, figs. 1—5.

Habitat.—Scarborough (Bean), Firth of Forth (Allman).

Geographical Distribution.—Holland and Norway.

6. *ASCANDRA BOTRYS* (*Haeckel*).

Ascandra botrys, Haeckel. L. c., p. 101, pl. xvi, figs. 1 a—1 f.

Habitat.—Budleigh-Salterton (Sonder), Portrush (Percival Wright).

7. *ASCANDRA VARIABILIS* (*Haeckel*).

Ascandra variabilis, Haeckel. L. c., p. 106, pl. xvi, figs. 4 a—4 l; pl. xviii.

Habitat.—Shetland and coasts of England (Norman), Bantry and Lough Strangford, Ireland (Norman).

Geographical Distribution.—Norway, coast of France, Morocco.

8. *LEUCYSSA INCRUSTANS* (*Haeckel*).

Leucyssa incrustans, Haeckel. L. c., p. 139, pl. xxv, figs. 1—10.

Trichogypsia villosa, Carter. Ann. Nat. Hist., ser. 4, vol. viii (1871), p. 1, pl. i, figs. 1—4.

Habitat.—Budleigh-Salterton (Carter).

Geographical Distribution.—Norway.

9. *LEUCALTIS PUMILA* (*Bow.*).

Leucaltis pumila, Haeckel. L. c., p. 148, pl. xxvii, figs. 2 a—2 g.

Leuconia pumila, Bowerbank.

Habitat.—Guernsey (Norman).

Geographical Distribution.—Morocco, Cape of Good Hope, Bass's Strait.

10. *LEUCANDRA CAMINUS* (*Haeckel*).

Leucandra caminus, Haeckel. L. c., p. 175, pl. xxxi, figs. 1a—1d;
pl. xxxvii, figs. 5 A, 5 B, 6.

Habitat.—Devon (Sonder).

Geographical Distribution.—Norway, Portugal, West Indies, Labrador.

11. *LEUCANDRA GOSSEI* (*Bow.*).

Leucandra Gossei, Haeckel. L. c., p. 177, pl. xxxii, figs. 2a—2f;
pl. xxxvii, figs. 9 A, 9 B.
Leucogypsia Gossei, Bowerbank.

Habitat.—Tobermory and Cornwall (Norman), Torquay (Gosse), Salterton (Sonder), Sark (Bowerbank).

Geographical Distribution.—Normandy.

12. *LEUCANDRA FISTULOSA* (*Johnston*).

Leucandra fistulosa, Haeckel. L. c., p. 197, pl. xxxi, figs. 4a—4f;
pl. xi, fig. 10.
Leuconia fistulosa, Bow.

Habitat.—Shetland (Norman), Eddystone Light-house (J. H. Stewart), Salterton (Sonder), Portaferry, Ireland (W. Thompson), Guernsey (Norman).

13. *LEUCANDRA ANANAS* (*Montagu*).

Leucandra ananas, Haeckel. L. c., p. 200, pl. xxxii, figs. 5a—5f;
pl. xl, figs. 1—8.

Spongia ananas, Montagu. Wern. Mem., ii, p. 97, pl. xvi, figs.
2, 3.

Spongia pulverulenta, Grant. Edinb. New. Phil. Journ., i, p. 170.

Scypha ovata, S. F. Gray. British Plants, i, p. 358.

Scycinula penicillata, O. Schmidt. Atlant. Spong., p. 73, pl. ii,
fig. 25.

Habitat.—Tobermory (Norman), Shetland (Fleming),
Salterton (Sonder), Devon (Montagu).

Geographical Distribution.—Greenland, Faroe Islands,
Norway, Normandy.

14. *LEUCANDRA NIVEA* (*Grant*).

Leucandra nivea, Haeckel. L. c., p. 211, pl. xxxiv, figs. 2a—2e;
pl. xxxix.

Leuconia nivea, Carter. Ann. Nat. Hist., ser. 4, vol. viii (1871),
p. 5.

Habitat.—Shetland (Peach), Tobermory (Norman),
Prestonpans (Grant), Tenby (Norman), Firth of Forth
(Grant), Northumberland (B. Embleton), Strangford
Lough (Norman).

Geographical Distribution.—Norway, Heligoland,
Normandy, Brittany.

15. *LEUCANDRA JOHNSTONII* (*Carter*).

Leucandra Johnstonii, Haeckel. L. c., p. 216, pl. xxxiv, figs.
1a—1h.

Grantia nivea, var. Johnston. Brit. Spong., p. 183, pl. xx, fig. 6.

Leuconia nivea, Bowerbank. I, p. 165, pl. xxvii, figs. 351, 352, ii,
p. 36.

Leuconia Johnstonii, Carter. Ann. Nat. Hist., ser. 4, vol. viii
(1871), p. 3, pl. i, figs. 5—12.

Habitat.—Lough Strangford (Norman), Scarborough (Bean), Budleigh-Salterton (Carter), Polperro (Laughrin, in Mus. Normani), Guernsey (Buckland), Sark (Bowerbank).

16. SYCORTIS QUADREANGULATA (*Schmidt*).

Sycortis quadrangulata, Haeckel. L. c., p. 280, pl. xlviii, figs. 3–8.

Syconella quadrangulata, Schmidt. Adriat. Spong., iii, Supplem., p. 29, pl. v, fig. 9.

Habitat.—Guernsey (Norman).

Geographical Distribution.—Brittany, Portugal, Gibraltar, Mediterranean.

17. SYCANDRA CILIATA (*O. Fab.*).

Sycandra ciliata, Haeckel. L. c., p. 296, pl. li, figs. 1a–1t; pl. lviii, fig. 9.

Grantia ciliata, Johnston. Brit. Spong., p. 176, pl. xx, figs. 4, 5; pl. xxi, figs. 6, 7.

Habitat.—Shetland and Hebrides (Norman), Firth of Forth (Grant), Great Cumbrae (Frauenfeld), Ipswich (Clarke), Plymouth and Polperro (Norman), Isle of Man (Johnston), Belfast (W. Thompson), Portrush (Percival Wright).

Geographical Distribution.—Greenland, Spitsbergen, Norway, Faroe Island, Newfoundland, Great Belt, Heligoland.

18. SYCANDEA CORONATA (*Ellis and Sol.*).

Sycandra coronata, Haeckel. L. c., p. 304, pl. li, figs. 2a–2t; pl. lx, figs. 1–6.

Grantia ciliata, Bowerbank. I, pl. xxvi, figs. 345, 346a; ii, p. 19.

Habitat.—Torquay (Griffiths), Weymouth (Max Schultze).

Geographical Distribution.—Brittany, Normandy, Portugal, Mediterranean, California, Sandwich Islands, Australia.

19. *SYCANDEA VILLOSA* (*Haeckel*).

Sycandra villosa, Haeckel. L. c., pl. lii, figs. 3 a—3 t; pl. lviii, fig. 1; pl. lx, fig. 8.

Habitat.—Moray Firth and Lough Strangford (Norman), Great Cumbræ (Frauenfeld).

Geographical Distribution.—Norway, French Coasts, Florida, West Indies, Venezuela.

20. *SYCANDEA ELEGANS* (*Bow.*).

Sycandra elegans, Haeckel. L. c., p. 338, pl. liv, figs. 3 a—3 t; pl. lviii, fig. 3.

Dunstervillia elegans, Bowerbank. Ann. Nat. Hist., vol. xv (1845), p. 297, pl. xvii.

Grantia tessellata, Bowerbank. British Spongiadæ.

Habitat.—Gouliot Caves, Sark (Buckland), Fermain Bay, Guernsey (Norman).

Geographical Distribution.—Portugal, Mediterranean, Canary Islands, West Indies, South Africa.

21. *SYCANDEA GLABRA* (*Schmidt*).

Sycandra glabra, Haeckel. L. c., p. 349, pl. lvi, figs. 1 a—1 t; pl. lx, fig. 14.

Ute glabra, Schmidt. Adriat. Spong., i, Supplem., p. 23, pl. iii, fig. 1.

Ute capillosa, Gray. Proc. Zool. Soc., 1867, p. 554.

Grantia ensata, Bowerbank. Brit. Spongiadæ.

Habitat.—Guernsey (Buckland).

Geographical Distribution.—French coasts, Mediterranean.

22. *SYCANDRA COMPRESSA* (*O. Fab.*).

Sycandra compressa, Haeckel. L. c., p. 360, pl. lv, figs. 2 a—2 t,
pl. lvii.

Grantia compressa, Bow.

Habitat.—Shetland, Tobermory, Oban, Moray Firth. Lough Strangford, Cornwall, &c. (Norman), Portrush Percival Wright), Firth of Forth (Grant), Berwick (Johnston), Ipswich River (Clarke), Tynemouth (Foster), Devon (Montagu).

Geographical Distribution. — Greenland, Iceland, Faroe Islands, Norway.

23. *SYCANDRA UTRICULUS* (*Schmidt*).

Sycandra utriculus, Haeckel. L. c., p. 370, pl. lv, figs. 3 a—3 t,
pl. lviii, fig. 4.

Ute utriculus, Schmidt. Atlant. Spong., p. 74, pl. ii, fig. 27.

Habitat.—Shetland (Norman).

Geographical Distribution.—Greenland, Iceland, Faroe Islands.

B. THE GENUS CLIONA.

In 1826 Robert Grant established a genus *Cliona* for a sponge which he found perforating the oysters of the Firth of Forth, and thirteen years afterwards a genus to receive the same perforating sponges was named by Nardo *Vioa*. In 1849 and 1867 my friend, Mr. Albany Hancock, described many species referable to this genus, and most clearly demonstrated that the perforations occupied by the sponge were excavated by the sponge itself. Dr. Bowerbank, however, persistently refused to entertain any other opinion than that these sponges always occupied previously-formed excavations and had no power of penetrating shell or stone themselves; nor would he acknowledge the species which had been so carefully described by Mr. Hancock, but united the whole of them under the sponge which he called *Hymeniacion celatus*. The following are the species of Hancock :

1. CLIONA CELATA (*Grant*).

C. celata, Hancock. Ann. Nat. Hist., ser. 2, vol. iii (1849), p. 332; and ser. 3, vol. xix (1867), p. 3 (separate copy).
Hymeniacion celatus, Bowerbank.

Sponge clear, yellow ochre colour. Spicules of one form only, spinulate, sometimes slightly fusiform, but generally gradually tapering, very long, $\frac{1}{50}$ th of an inch; head well defined, globular, approaching ovate, with generally a terminal point.

Common in oyster shells, Firth of Forth, &c.

2. CLIONA GORGONOIDES, *Hancock*.

Cliona gorgonoides, Hancock. L. c., vol. iii, p. 332, vol. xix, p. 9.

Spicula spinulate, $\frac{1}{8}$ th of an inch long; head oval, frequently at some little distance from extremity.

"A critical species, and is probably a mere variety of *C. celata*" (Hancock).

Abundant, riddling species of limestone on the Northumberland Coast.

3. CLIONA NORTHUMBRICA, *Hancock*.

Cliona Northumbrica, Hancock. L. c., vol. iii, p. 336; vol. xix, p. 9, pl. vii, fig. 1.

Pione Northumbrica, Gray. Proc. Zool. Soc., 1867, p. 525.

Cliona Northumbrica, Carter. Ann. Nat. Hist., ser. 4, vol. v (1870), p. 75.

Sponge pale ochreous yellow (when dry). Spicula of three kinds, the first much the largest, measuring $\frac{1}{7}$ th of an inch long, spinulate, straight, sharp-pointed; head large, round and terminal: the second acerate, scarcely more than one-fourth the length of the first, rather stout, much and suddenly bent in the middle, both ends sharply pointed, and when viewed through a one-sixth inch object glass, is seen to be minutely spinous: the third form is very minute, $\frac{1}{180}$ th of an inch long, cylindrical, bent sharply in the centre, and apparently smooth under the one-sixth object glass, though occasionally there are slight indications of spines; the extremities are recurved, slightly enlarged and rounded.

The second and third forms of spicules are more numerous than the first, which is most abundant in the papillæ.

In shells of oysters and *Fusus antiquus* or Northumberland coast (Hancock), Devon (Parfitt and Carter).

4. *CLIONA VASTIFICA*, *Hancock*.

Cliona vastifica, Hancock. L. c., vol. iii, p. 342; vol. xix, p. 9, pl. vii, fig. 2.

Spicula of three kinds, the first spinulate, $\frac{1}{87}$ th of an inch long, straight, rather slender, and diminishing imperceptibly to a very fine point at one end, the other terminating in a perfectly globular head: the second acerate, one-third the length of the first, and much more slender, stoutish in the centre, where it rather suddenly bends a little and thence tapers gradually towards the ends, which are sharply pointed; everywhere minutely spined, but in some instances the spines are sufficiently strong to be observed with a one-fourth inch object glass: the third form is $\frac{1}{2100}$ th of an inch long, cylindrical, irregularly bent or angulated once or twice, occasionally three times; it has a central angle and is strongly spined, the extremities are obtuse.

In oyster shells.

5. *CLIONA CORALLINOIDES*, *Hancock*.

Cliona corallinoides, Hancock. L. c., vol. iii, p. 337, pl. xv, figs. 1 and 2; vol. xix, p. 10, pl. vii, fig. 3.

Cliona corallinoides, Carter. Ann. Nat. Hist., ser. 4, vol viii (1871), p. 14 (separate copy), pl. ii, figs. 34—37.

Spicula of three kinds, the first spinulate, $\frac{1}{70}$ th of

an inch long, slender, generally bent in the centre, tapering gradually to a sharp point at one end, and at the other furnished with a well-defined elliptical head: the second acerate, scarcely one-third the length of the first, very delicate, and suddenly bent in the centre, and when observed with the one-sixth inch object glass is seen to be minutely spined; the extremities are sharply pointed: the third is minute, $\frac{1}{2000}$ th of an inch long, spinous, with obtuse extremities and generally zigzagged, having three angles, one being in the centre.

In shells of *Pecten maximus*, Guernsey, &c.

6. CLIONA GRACILIS, *Hancock*.

Cliona gracilis, Hancock. L. c., vol. iii, p. 334, pl. xiv, fig. 7;
vol. xix, p. 10, pl. vii, fig. 4.

Spicula of three kinds, the first spinulate, $\frac{1}{77}$ th of an inch long, generally a little bent, stout, and inclining to fusiform, with the pointed end gradually tapering; head rounded, somewhat elliptical, and merging imperceptibly into the shaft: the second acerate, one-third the length of the first, less stout and gradually bent in the centre; it is minutely spined, and has the extremities sharply pointed: the third is about $\frac{1}{1500}$ th of an inch long, and is usually zigzagged, so as to form four or five angles. It is most minutely spined, and has the extremities rounded and recurved.

When dry the sponge is of a yellowish-brown colour.

In a shell of *Pecten maximus* probably from Orkney.

7. CLIONA HOWSEI, *Hancock*.

Cliona Howsei, Hancock. L. c., vol. iii, p. 336, pl. xiv, fig. 8; vol. xix, p. 10, pl. vii, fig. 5.

Spicula of three kinds, the first spinulate, about $\frac{1}{100}$ th of an inch long, very delicate, generally straight, with the head broadly ovate, short, well-marked, terminal, and having the narrow end at the extremity and sometimes a little prolonged: the second abundant and somewhat longer than the first, equally slender, mostly slightly bent, and gradually diminishing to a fine point at one extremity, the other extremity has usually two heads, one terminal or nearly so, the second about one-third down the shaft, the terminal head is frequently wanting: the third is about $\frac{1}{800}$ th of an inch long, rather stout, cylindrical, usually irregularly bent or angulated and strongly spined with the extremities obtuse.

The sponge when dry is of a pale yellow ochre colour.

In the shell of *Fusus antiquus* and in *Nullipore* from the Northumberland coast (Mr. Howse).

8. CLIONA ALDERI, *Hancock*.

Cliona Alderi, Hancock. L. c., vol. iii, p. 337, pl. xv, fig. 9; vol. xix, p. 11.

Idomon Alderi, Gray. Proc. Zool. Soc., 1867, p. 526.

Spicula of two kinds, the first spinulate, $\frac{1}{116}$ th of an inch long, moderately thick, slightly bent, with a small head near one end and tapering to the other extremity: the second scarcely shorter than the first, and has one end truncate, the other pointed, and is decidedly bent in the centre.

Sponge in a dried state, of a brownish-yellow colour.

In shells of *Pectunculus pilosus*, Isle of Man (Mr. Alder).

9. CLIONA LOBATA, *Hancock*.

Cliona lobata, Hancock. L. c., vol. iii, p. 341, pl. xii, figs. 4 and 8; vol. xix, p. 11, pl. vii, fig. 6.

Pronax lobata, Gray. Proc. Zool. Soc., 1867, p. 526.

Spicula of two kinds, the first spinulate, $\frac{1}{100}$ th of an inch long, not very slender, mostly a little bent, and brought gradually to a sharp point at one end, the other with an irregularly rounded head, sometimes slightly elliptical, and generally not exactly terminal: the second cylindrical, $\frac{1}{500}$ th of an inch long, rather stout, arched and zigzagged, being six or seven times angulated; it is strongly spined, particularly at the angles; the extremities are obtuse.

The dried sponge is of a dark snuff colour.

In shells of *Haliotis tuberculata* from Guernsey, and in an oyster from the West of Scotland.

C. VARIOUS BRITISH SPONGES.

1. HALISARCA DUJARDINII, *Johnston*.

Halisarca, Dujardin. Ann. des Sci. Nat., n.s., vol. x, p. 7, pl. i, fig. 5.

Halisarca Dujardinii, Johnston. Brit. Spong., 1842, p. 192, pl. xvi, fig. 8.

Halisarca Dujardinii, Carter. Ann. Nat. Hist., ser. 4, vol. xii (1873), p. 25; and vol. xiii (1874), p. 315.

Habitat.—Berwick Bay, Holy Island (Johnston), Budleigh-Salterton (Carter).

This is not the sponge described by Bowerbank under this name and which is spiculiferous. The true *Halisarca* forms a thin gelatinous crust, which is entirely devoid of spicula.

2. HALISARCA LOBULARIS, *Schmidt*.

Halisarca lobularis, Schmidt. Spong. des Adriat. Meeres, 1862, p. 80.

Halisarca lobularis, Carter. Ann. Nat. Hist., ser. 4, vol. xiii (1874), p. 433.

Sponge consisting of irregularly lobed ridges about a line high, extending themselves in branched digitations over the rock. Lobes ficoid, agglomerated, divided into minute lobuli with angular pits or intervals between them, when they cannot from their rounded forms come into contact. Surface smooth, sleek, and of a pink colour on the prominent portions, passing into light-brown yellow below. Vents sparse, situated here and there on the lobes, not raised above the surface, and sufficiently large to be visible to the naked eye. Pores minute and numerous, each consisting of a round aperture situated in the centre of a papilliform ring, which rings being in juxtaposition thus form the dermal surface of the lobule. No spicules of any kind. Size of specimen one and a half inch long by one inch wide and one line high.

Habitat.—New Red Sandstone Rocks, Budleigh-Salterton.

Geographical Distribution.—Adriatic Sea.

3. *STELLETTA LACTEA*, *Carter*.

Stelletta lactea, Carter. Ann. Nat. Hist., ser. 4, vol. vii (1871),
p. 9, pl. iv, figs. 15–22.

Massive, spreading, fixed, following and filling the cavities of deciduous small boring shells (*Saxicavæ*) and Annelids, communicating with the exterior only through the openings of the cavities. Dermal layer thin, white, densely charged with minute stellates. Body-substance opalescent, soft, compact, composed of areolar sarcode traversed in all directions by the branches of the excretory canal systems, which, uniting, finally terminate in their respective oscules, charged more or less with the same kind of stellates as those of the dermal membrane, together with minute sheaf-like bundles of acerate spicules, which in certain directions reflect the light like the micaceous particles in granite.

Spicules of five kinds. 1. The largest, acerate, smooth, fusiform, slightly curved, about $\frac{1}{20}$ th of an inch long; 2, trifid, smooth, with shaft pointed at one end and provided with three arms at the other, spreading horizontally in the opposite direction, more or less inclined forwards towards the long axis of the shaft, vase-like, straight or slightly flexuous, smooth, pointed. These spicules are $\frac{1}{30}$ th of an inch long; 3, the same, with the ends of the arms more or less bifurcated; 4, stellate spicules, with long body and short thick rays, or with long rays and hardly any body, about $\frac{1}{2000}$ th of an inch in diameter; 5, sheaf-like bundles of minute, smooth, acerate spicules lying parallel to each other and about $\frac{1}{1000}$ th of an inch long. The large acerate spicules are more or less spread throughout the sponge, the trifid ones of both

kinds chiefly confined to the surface, where they are arranged vertically with their heads toward the dermal layers and their shafts internally; the stellates, although most numerous and packed together crust-like in the dermal layer, are also scattered throughout the body-substance; while the sheaf-like bundles of minute acerate spicules are entirely confined to the latter.

Habitat.—Budleigh-Salterton (Carter).

I am inclined to think that *Stelletta lactea* of Carter may be synonymous with *Tethya Collingsii*, Bowerbank; but Carter figures the two forms of stellates as of equal total diameter, whereas in *T. Collingsii* the long rayed form is some three times the diameter of the short rayed, and has far fewer rays; in *T. Collingsii*, moreover, the bifurcating trifid spicula are few and are evidently a mere variety of the recurving trifids.

4. RENIERA PARFITT, *Bow*.

Reniera Parfitti, Bowerbank. In Parfitt Marine and Freshwater Sponges of Devonshire. Trans. Devon. Ass. Advanc. Liter. Science and Art, 1868, p. 10.

“Massive, sessile; surface smooth, somewhat undulated; oscula simple and sparsely distributed, slightly raised above the surface; pores inconspicuous to the unassisted eye; dermal membrane abundantly spiculous; spicula very irregularly disposed, imbedded in the membrane; spicula acerate, stout, with a few more slender ones intermixed, of two sizes; skeleton spicula very numerous, acerate, stout, suddenly and acutely pointed, $\frac{7}{1000}$ th of an inch long and $\frac{1}{1000}$ th of an inch

in diameter; sarcode not abundant, yellow examined dry. Dredged off Torbay, 1867.

This very distinct species was, when fresh, of a golden yellow colour, it dries to a pale yellow. Three small specimens are all that I have seen of this, each about two inches in diameter and about an inch thick. They grew attached to stones in about twenty fathoms of water. I presented a specimen to Dr. Bowerbank, who has paid me the compliment to name it after me."

Such is Mr. Parfitt's description. I can find no reference to this sponge, either in Dr. Bowerbank's publications or among his manuscripts which came into my hands; and the foregoing description is too loose to enable this species to be recognised.

A large number of sponges were dredged around the Western coasts of Great Britain, in greater depths than 100 fathoms, in 1869 by H.M.S. "Porcupine." Descriptions of these sponges must be sought in Sir Wyville Thomson's 'Depths of the Sea' and in Mr. Carter's papers in the 'Annals.'

INDEX.

A.	PAGE		PAGE
<i>Abila levis</i>	52	<i>Ascandra contorta</i>	226
<i>Anchinoe perarmata</i>	72	„ <i>variabilis</i>	227
<i>Adocia simulans</i>	125	<i>Ascortis lacunosa</i>	226
<i>Adreus fascicularis</i>	46	<i>Asychus variantia</i>	85
<i>Egagrophila varians</i>	180	<i>Azinella pumila</i>	47
<i>Alebion Hyndmani</i>	152	„ <i>rugosa</i>	48
<i>Amorphina albescens</i>	70		
„ <i>aurea</i>	86	B.	
„ <i>Brettii</i>	75	<i>Battersbyia</i>	93
„ <i>caruncula</i>	81	„ <i>Bucklandi</i>	93
„ <i>coccinea</i>	72	<i>Biemma candida</i>	110
„ <i>consimilis</i>	83	„ <i>constricta</i>	174
„ <i>caduca</i>	95	„ <i>corrugata</i>	107
„ <i>coalita</i>	96	„ <i>inornata</i>	114
„ <i>distorta</i>	99	„ <i>Jeffreysii</i>	171
„ <i>fallaciosa</i>	75	„ <i>Peachii</i>	173
„ <i>fragilis</i>	75	„ <i>pulchella</i>	111
„ <i>glabra</i>	99	<i>Bubaris vermiculata</i>	54
„ <i>inconspicua</i>	96		
„ <i>lactea</i>	72	C.	
„ <i>membrana</i>	72	<i>Cacospongia pulchella</i>	183
„ <i>panicea</i>	98	„ <i>scalaris</i>	183
„ <i>reticulata</i>	75	„ <i>Zetlandica</i>	188
„ <i>sanguinea</i>	81	<i>Calcarea</i>	25
„ <i>Thomasii</i>	71	<i>Caminus osculatus</i>	28
Appendix of additional species	225	<i>Carmia floreum</i>	162
<i>Ascartis botryoides</i>	226	„ <i>macilentia</i>	83
<i>Ascetta coriacea</i>	225		
<i>Ascandra botrys</i>	227		
„ <i>complicata</i>	226		

	PAGE		PAGE
<i>Chalinula limbata</i> . . .	186	<i>Dendoryz Pattersoni</i> . . .	111
„ <i>oculata</i> . . .	185	„ <i>Thompsoni</i> . . .	105
<i>Chalina</i> . . .	185	<i>Dercitus Bucklandi</i> . . .	93
„ <i>cervicornis</i> . . .	185	„ <i>niger</i> . . .	93
„ <i>Flemingii</i> . . .	185	<i>Desmacidon</i> . . .	170
„ <i>gracilentia</i> . . .	186	„ <i>ægagropilus</i> . . .	180
„ <i>Grantii</i> . . .	186	„ <i>cavernula</i> . . .	179
„ <i>inornata</i> . . .	186	„ <i>columella</i> . . .	182
„ <i>limbata</i> . . .	186	„ <i>constrictus</i> . . .	174
„ <i>Montagni</i> . . .	185	„ <i>copiosus</i> . . .	178
„ <i>oculata</i> . . .	185	„ <i>fruticosus</i> . . .	170
„ <i>seriata</i> . . .	187	„ <i>incognitus</i> . . .	176
<i>Ciocalypta</i> . . .	38	„ <i>jecusculum</i> . . .	53
„ <i>Leei</i> . . .	38	„ <i>Jeffreysii</i> . . .	170
„ <i>penicillus</i> . . .	38	„ <i>macilentus</i> . . .	83
Classified List of British		„ <i>pannosus</i> . . .	176
<i>Sponges</i> . . .	5	„ <i>paupertas</i> . . .	92
<i>Clathria Beanii</i> . . .	150	„ <i>perarmatus</i> . . .	72
„ <i>papilla</i> . . .	187	„ <i>Peachii</i> . . .	173
<i>Clathrina sulphurea</i> . . .	225	„ <i>plumosus</i> . . .	53
<i>Cliona Alderi</i> . . .	237	„ <i>rotalis</i> . . .	179
„ <i>celata</i> . . .	90, 223	„ <i>similaris</i> . . .	179
„ <i>corallinoides</i> . . .	235	„ <i>varians</i> . . .	85
„ <i>gorgonoides</i> . . .	234	<i>Dictyocylindrus</i> . . .	45
„ <i>gracilis</i> . . .	236	„ <i>aculeatus</i> . . .	46
„ <i>Howsei</i> . . .	237	„ <i>fascicularis</i> . . .	46
„ <i>lobata</i> . . .	238	„ <i>hispidus</i> . . .	46
„ <i>Northumbrica</i> . . .	234	„ <i>Howsei</i> . . .	46
„ <i>vastifica</i> . . .	235	„ <i>pumilus</i> . . .	47
<i>Collingsia sarniensis</i> . . .	44	„ <i>radiosus</i> . . .	46
„ <i>Schmidtii</i> . . .	44	„ <i>ramosus</i> . . .	45
<i>Corybas lobata</i> . . .	139	„ <i>rectangulus</i> . . .	48
<i>Cydonium Mülleri</i> . . .	27	„ <i>rugosus</i> . . .	48
		„ <i>stuposus</i> . . .	48
		„ <i>ventilabrum</i> . . .	45
		„ <i>virgulosus</i> . . .	47
D.		<i>Diplodemia</i> . . .	183
<i>Dendoryz albula</i> . . .	112	„ <i>vesicula</i> . . .	183
„ <i>Batei</i> . . .	111	<i>Dirrhopalum coriaceum</i> . . .	136
„ <i>Dickiei</i> . . .	110	Distribution, geographical	
„ <i>granulata</i> . . .	114	table of . . .	15
„ <i>incrustans</i> . . .	110	<i>Donatia aurantium</i> . . .	44
„ <i>irregularis</i> . . .	110	<i>Dunstervillia elegans</i> . . .	231

	PAGE		PAGE
Dysidea	188	Grantia compressa	25, 232
„ fragilis	188	„ ensata	25, 232
„ coriacea	189	„ nivea	229
		„ tessellata	25, 231
E.		H.	
<i>Epicles radiosus</i>	56	Halichondria	95
<i>Ephydatia fluviatilis</i>	168	„ albula	112
<i>Ecionemia</i>	30	„ ambigua	99
„ coactura	31	„ angulata	99
„ compressa	30	„ Batei	111
„ ponderosa	30	„ caduca	95
<i>Esperia ægagrophila</i>	180	„ candida	110
„ florea	162	„ Clarkei	139
„ lingua	162	„ coalita	96
„ spinulenta	52	„ coccinea	72
„ subclavata	92	„ condensa	102
<i>Euplectella brevis</i>	31	„ coralloides	104
„ mammillaris	32	„ corrugata	107
„ robusta	31	„ Couchii	99
<i>Euryphon clavatum</i>	55	„ cylindræa	96
		„ Dickiei	110
F.		„ distorta	99
<i>Ficulina anomala</i>	120	„ edusa	99
„ ficus	89	„ expansa	112
		„ falcula	107
G.		„ fallax	83
<i>Gastrophysæma dithalamium</i>	33	„ farinaria	114
„ scopula	33	„ fimbriata	153
<i>Gellius jugosus</i>	131	„ flabellifera	107
„ robusta	171	„ foliata	106
<i>Geodia</i>	27	„ forceps	105
„ megastrella	27	„ forcipis	105
„ Zetlandica	27	„ glabra	99
Geographical distribution	15	„ granulata	114
<i>Grantia</i>	25	„ Hyndmani	152
„ botryoides	226	„ incerta	96
„ ciliata	25, 230	„ inconspicua	96
		„ incrustans	110
		„ Ingalli	111
		„ inornata	114

	PAGE		PAGE
<i>Halichondria irregularis</i>	. 110	<i>Hymedesmia pulchella</i>	. 61
" <i>lingua</i>	. 162	" <i>radiata</i>	. 56
" <i>McIntoshii</i>	. 95	" <i>simplicissima</i>	. 68
" <i>mutulus</i>	. 96	" <i>stellata</i>	. 67
" <i>nigricans</i>	. 112	" <i>tenuicula</i>	. 68
" <i>panicea</i>	. 98	" <i>Zetlandica</i>	. 70
" <i>Pattersoni</i>	. 111	<i>Hymeniacion</i>	. 70
" <i>pulchella</i>	. 111	" <i>albescens</i>	. 70
" <i>paupera</i>	. 139	" <i>Aldousii</i>	. 84
" <i>regularis</i>	. 95	" <i>armaturus</i>	. 86
" <i>Robertsoni</i>	. 100	" <i>armiger</i>	. 73
" <i>scandens</i>	. 111	" <i>aureus</i>	. 86
" <i>simplex</i>	. 106	" <i>Brettii</i>	. 75
" <i>subdola</i>	. 106	" <i>Bucklandi</i>	. 93
" <i>Thompsoni</i>	. 105	" <i>callosus</i>	. 86
" <i>virgea</i>	. 112	" <i>carnosus</i>	. 88
<i>Haliclona Columbæ</i>	. 185	" <i>caruncula</i>	. 81
" <i>gracilentæ</i>	. 186	" <i>celatus</i>	. 90
" <i>Montagui</i>	. 185	" <i>claviger</i>	. 90
" <i>pulmata</i>	. 132	" <i>coccineus</i>	. 72
" <i>pygmæa</i>	. 118	" <i>consimilis</i>	. 83
" <i>seriata</i>	. 187	" <i>crustula</i>	. 79
" <i>simulans</i>	. 125	" <i>Dujardinii</i>	. 92
<i>Halicnemis</i>	. 45	" <i>fallaciosus</i>	. 75
" <i>patera</i>	. 45	" <i>fallax</i>	. 83
<i>Halina Bucklandi</i>	. 93	" <i>ficus</i>	. 89
" <i>carnosa</i>	. 88	" <i>firmus</i>	. 73
" <i>ficus</i>	. 89	" <i>floreum</i>	. 162
" <i>suberea</i>	. 88	" <i>foliatus</i>	. 89
<i>Halisarca Dujardinii</i>	. 92, 238	" <i>fragilis</i>	. 75
" <i>lobularis</i>	. 239	" <i>gelatinosus</i>	. 88
<i>Halyphysema</i>	. 33	" <i>Hillieri</i>	. 79
" <i>ramulosa</i>	. 38	" <i>jecusculum</i>	. 53
" <i>primordiale</i>	. 33	" <i>lacteus</i>	. 72
" <i>Tumanowiczii</i>	. 33	" <i>lingua</i>	. 162
" <i>Tumanowiczii</i>	. 38	" <i>macilentus</i>	. 83
<i>Hymedesmia</i>	. 56	" <i>mammatæus</i>	. 82
" <i>indistincta</i>	. 56	" <i>medius</i>	. 84
" <i>inflata</i>	. 56	" <i>membrana</i>	. 72
" <i>occulta</i>	. 56	" <i>pachyderma</i>	. 79
" <i>pansa</i>	. 56	" <i>paupertas</i>	. 92
" <i>Peachii</i>	. 64	" <i>perarmatus</i>	. 72
" <i>pilata</i>	. 59	" <i>perlævis</i>	. 79

	PAGE		PAGE
<i>Hymeniacion placentula</i>	73	<i>Isodictya crassa</i>	126
„ <i>plumiger</i>	88	„ <i>deformis</i>	160
„ <i>plumosus</i>	53	„ <i>densa</i>	125
„ <i>radiosus</i>	84	„ <i>dichotoma</i>	123
„ <i>reticulatus</i>	75	„ <i>dissimilis</i>	135
„ <i>sanguineus</i>	81	„ <i>dubia</i>	140
„ <i>solidus</i>	76	„ <i>Edwardii</i>	138
„ <i>subclavatus</i>	92	„ <i>elegans</i>	121
„ <i>subereus</i>	88	„ <i>fallax</i>	121
„ <i>sulphureus</i>	89	„ <i>ferula</i>	116
„ <i>tegeticula</i>	76	„ <i>filamenta</i>	129
„ <i>tenebrosus</i>	90	„ <i>fimbriata</i>	153
„ <i>Thomasii</i>	71	„ <i>fistulosa</i>	123
„ <i>varians</i>	85	„ <i>fucorum</i>	138
„ <i>variantia</i>	85	„ <i>funalis</i>	150
„ <i>virgultosus</i>	83	„ <i>gracilis</i>	136
„ <i>virgulatus</i>	84	„ <i>Gregorii</i>	125
„ <i>viridans</i>	86	„ <i>hispida</i>	136
<i>Hymenaphia</i>	54	„ <i>Hyndmani</i>	152
„ <i>clavata</i>	55	„ <i>imitata</i>	141
„ <i>coronula</i>	55	„ <i>implicita</i>	154
„ <i>simplex</i>	55	„ <i>inæqualis</i>	157
„ <i>stellifera</i>	55	„ <i>incerta</i>	126
„ <i>vermiculata</i>	54	„ <i>indefinita</i>	118
„ <i>verticillata</i>	55	„ <i>indistincta</i>	119
		„ <i>infundibuliformis</i>	135
		„ <i>Ingalli</i>	126
		„ <i>invalida</i>	136
		„ <i>involuta</i>	143
		„ <i>jugosa</i>	131
		„ <i>laciniosa</i>	140
		„ <i>lobata</i>	139
		„ <i>lurida</i>	152
		„ <i>luteosa</i>	120
		„ <i>mammeata</i>	115
		„ <i>McAndrewi</i>	122
		„ <i>nodosa</i>	141
		„ <i>Normani</i>	136
		„ <i>obscura</i>	118
		„ <i>pallida</i>	125
		„ <i>palmata</i>	132
		„ <i>parasitica</i>	120
		„ <i>paupera</i>	139
I.			
<i>Idomon Alderi</i>	237		
<i>Iophon nigricans</i>	112		
„ <i>scandens</i>	111		
<i>Isodictya</i>	115		
„ <i>Alderi</i>	138		
„ <i>anomala</i>	120		
„ <i>Barleei</i>	140		
„ <i>Beanii</i>	150		
„ <i>Bowerbanki</i>	128		
„ <i>cinerea</i>	115		
„ <i>Clarkei</i>	139		
„ <i>clava</i>	130		
„ <i>collina</i>	147		
„ <i>coriacea</i>	136		

	PAGE		PAGE
<i>Ophlitaspongia seriata</i> . . .	187	<i>Raphiodesma intermedium</i> . . .	166
<i>Orina angulata</i> . . .	99	" <i>lingua</i> . . .	162
		" <i>simplicissimum</i> . . .	163
		" <i>sordidum</i> . . .	163
P.		<i>Raphyrus</i> . . .	182
<i>Pachastrella Bucklandi</i> . . .	93	" <i>Griffithsii</i> . . .	182
<i>Pachymatisma</i> . . .	28	<i>Raspailia radiosa</i> . . .	46
" <i>Johnstonia</i> . . .	28	" <i>ramosa</i> . . .	45
<i>Papillina suberea</i> . . .	182	" (?) <i>stelligera</i> . . .	46
<i>Pencillaria mammillaris</i> . . .	32	" <i>stuposa</i> . . .	48
<i>Phakellia</i> . . .	48	" (?) <i>viminalis</i> . . .	46
" <i>infundibuliformis</i> . . .	135	" <i>virgultosa</i> . . .	47
" <i>robusta</i> . . .	48	<i>Reniera albescens</i> . . .	70
" <i>ventilabrum</i> . . .	48	" <i>armatura</i> . . .	86
<i>Philotia varians</i> . . .	121	" <i>aurea</i> . . .	86
<i>Pione Northumbrica</i> . . .	234	" <i>Brettii</i> . . .	75
<i>Polymastia</i> . . .	31	" <i>caruncula</i> . . .	81
" <i>brevis</i> . . .	31	" <i>coccinea</i> . . .	72
" <i>bulbosa</i> . . .	31	" <i>consimilis</i> . . .	83
" <i>conigera</i> . . .	33	" <i>crustula</i> . . .	79
" <i>mammillaris</i> . . .	32	" <i>fallaciosa</i> . . .	75
" <i>ornata</i> . . .	31	" <i>fallax</i> . . .	83
" <i>radiosa</i> . . .	32	" <i>fragilis</i> . . .	75
" <i>robusta</i> . . .	31	" <i>lactea</i> . . .	72
" <i>spinula</i> . . .	32	" <i>mammeata</i> . . .	82
<i>Pronæ plumosa</i> . . .	53	" <i>membrana</i> . . .	72
" <i>lobata</i> . . .	238	" <i>pachyderma</i> . . .	79
		" <i>perlævis</i> . . .	79
Q.		" <i>reticulata</i> . . .	75
<i>Quasillina brevis</i> . . .	31	" <i>sanguinea</i> . . .	81
		" <i>Thomasii</i> . . .	71
		" <i>virgultosa</i> . . .	83
		" <i>viridans</i> . . .	86
R.		S.	
<i>Radiella spinularia</i> . . .	45	<i>Scopalina fallax</i> . . .	5
<i>Raphioderma</i> . . .	162	<i>Scypha ovata</i> . . .	229
" <i>coacervata</i> . . .	162	<i>Seriatula seriata</i> . . .	187
<i>Raphiodesma</i> . . .	162	<i>Silicea</i> . . .	27
" <i>fallaciosum</i> . . .	163	<i>Siphonochalina</i> (P) <i>Flemingii</i> . . .	185
" <i>floreum</i> . . .	162	<i>Sophax fallax</i> . . .	2

	PAGE	T.	PAGE
<i>Spinularia tetheoides</i> . . .	45	<i>Tereus fimbriatus</i> . . .	153
<i>Spongelia fragilis</i> . . .	188	<i>Tethea</i> , see <i>Tethya</i> .	
<i>Spongia ananas</i> . . .	229	<i>Tetilla cranium</i> . . .	39
„ <i>limbata</i> . . .	186	<i>Tethya</i> . . .	39
„ <i>pulchella</i> . . .	183	„ <i>abyssorum</i> . . .	42
„ <i>pulverulenta</i> . . .	229	„ <i>Collingsii</i> . . .	44
<i>Spongilla</i> . . .	168	„ <i>cranium</i> . . .	39
„ <i>fluviatilis</i> . . .	168	„ <i>infrequens</i> . . .	43
„ <i>lacustris</i> . . .	169	„ <i>Lyncurium</i> . . .	44
„ <i>Mayeni</i> . . .	168	„ <i>morum</i> . . .	44
„ <i>Parfitti</i> . . .	168	„ <i>muricata</i> . . .	29
„ <i>sceptrifera</i> . . .	169	„ <i>Schmidtii</i> . . .	44
<i>Spongionella</i> . . .	183	„ <i>spinosa</i> . . .	45
„ <i>pulchella</i> . . .	183	„ <i>spinularia</i> . . .	45
<i>Squamulina scopula</i> . . .	33, 38	„ <i>Zetlandica</i> . . .	39
<i>Stelletta aspera</i> . . .	30	<i>Timea stellata</i> . . .	67
„ <i>Collingsii</i> . . .	44	<i>Tragosia infundibuliformis</i> . . .	135
„ <i>lactea</i> . . .	240	„ <i>dissimilis</i> . . .	135
„ <i>Schmidtii</i> . . .	44	<i>Trichogypsia villosa</i> . . .	227
<i>Suberites carnosa</i> . . .	88		
„ <i>clavigera</i> . . .	90	U.	
„ <i>domuncula</i> . . .	88	<i>Ute capillosa</i> . . .	232
„ <i>ficus</i> . . .	89	„ <i>glabra</i> . . .	231
„ <i>gelatinosa</i> . . .	88	„ <i>urticulus</i> . . .	232
„ <i>suberea</i> . . .	88		
„ <i>sulphurea</i> . . .	89	V.	
<i>Sycandra ciliata</i> . . .	230	<i>Verongia</i> . . .	188
„ <i>compressa</i> . . .	232	„ <i>Zetlandica</i> . . .	188
„ <i>coronata</i> . . .	230	<i>Vibulinus aculeatus</i> . . .	46
„ <i>elegans</i> . . .	231	„ <i>stuposus</i> . . .	48
„ <i>glabra</i> . . .	231	<i>Vioa celata</i> . . .	90
„ <i>utriculus</i> . . .	232		
„ <i>villosa</i> . . .	231	W.	
<i>Sycimula penicillata</i> . . .	229	<i>Wyvillethomsonia Wallichii</i> . . .	29
<i>Syconella quadrangulata</i> . . .	230		
<i>Sycortis quadrangulata</i> . . .	230		



PLATE I.

"HYMEDESMIA PANSA, *Bowerbank*.

Fig. 1.—A small portion of the sponge, exhibiting the mode of fasciculation and disposition of the skeleton fasciculi. $\times 250$ linear.

Fig. 2.—One of the long, slender, acute spicula of the skeleton fasciculi. $\times 420$ linear.

Fig. 3.—Represents one of the attenuato-acute, entirely spined defensive spicula. $\times 420$ linear.

Fig. 4.—One of the bidentate, equi-anchorate, retentive spicula. $\times 420$ linear."

"HYMEDESMIA TENUICULA, *Bowerbank*.

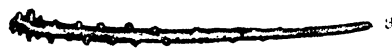
Fig. 5.—Represents a portion of the flat fasciculi composed of numerous attenuato-spinulate spicula, and the irregular mode of their disposition. $\times 150$ linear.

Both the species figured above depend for their identification on their microscopical structures alone; figures of their extremely thin substances would not contribute in the slightest degree to their identification."

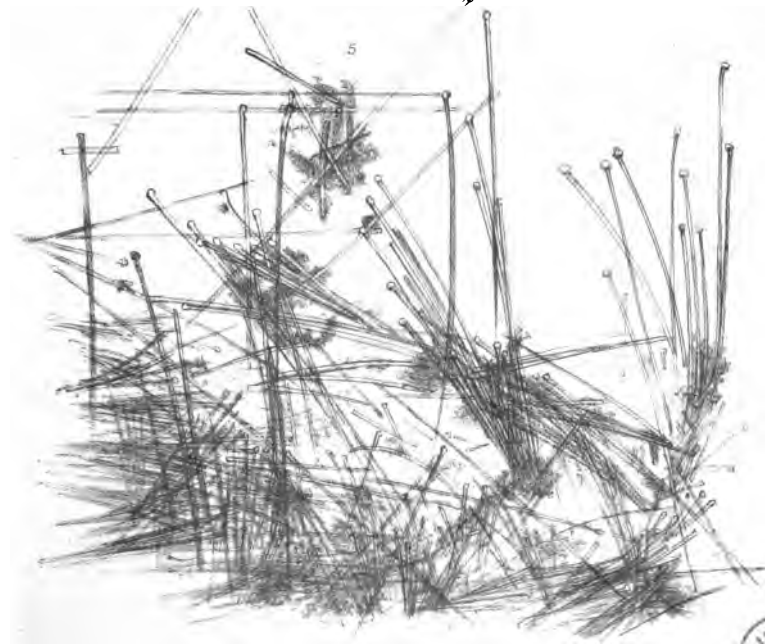
1



2



3



Hymedesmia pansa 1-4. H. tenuicula 5.

Dorsal del. et lith.

Wheat & Co. 1201

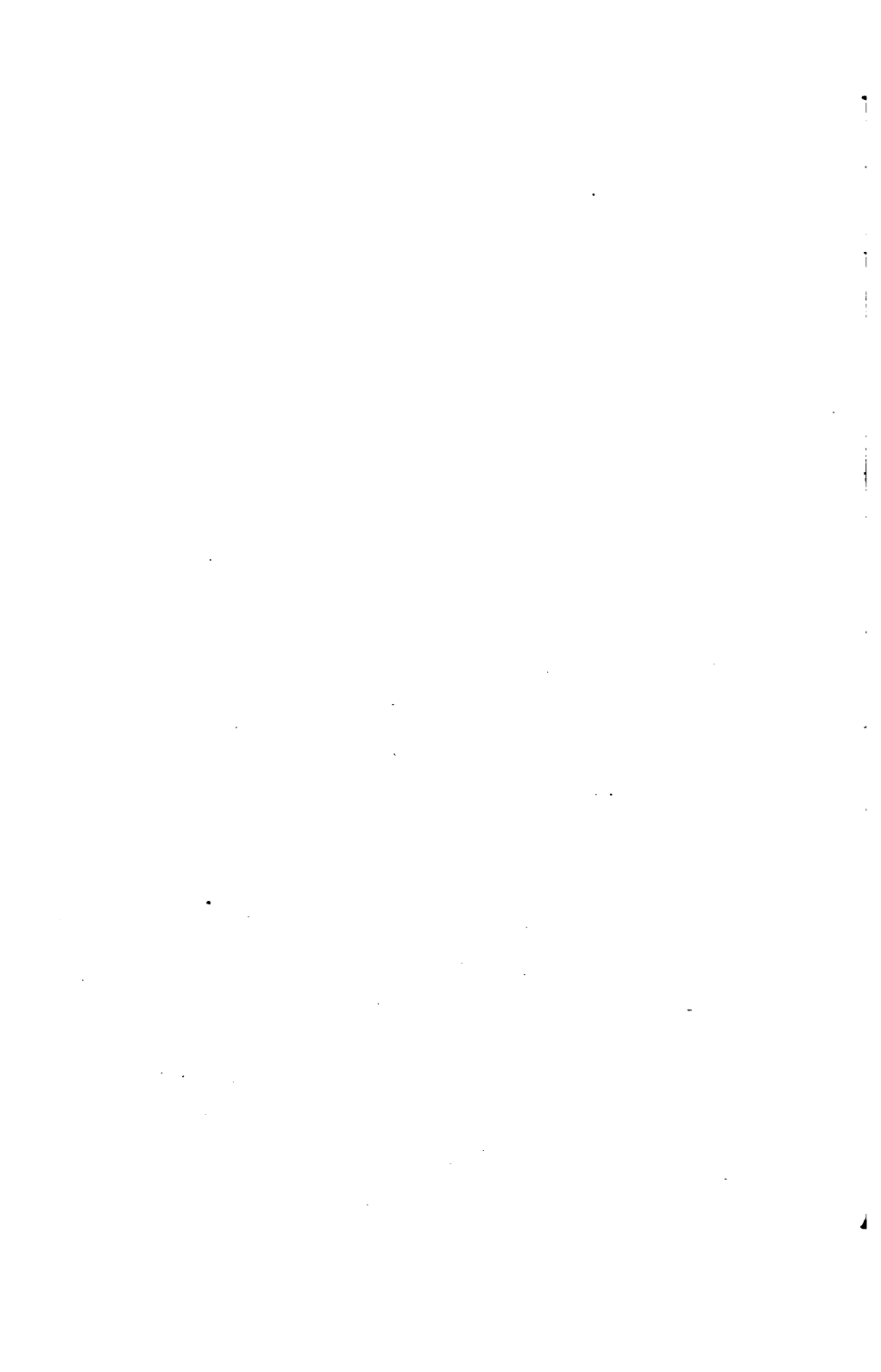




PLATE II.

"HYMEDESMIA PILATA, *Bowerbank*."

Fig. 1.—Represents a small portion of the sponge exhibiting the nodes of the disposition of the skeleton and other spicula of which it is composed. $\times 264$ linear.

Fig. 2.—One of the contort, bihamate, retentive spicula of the dermal membrane. $\times 420$ linear.

Fig. 3.—One of the attenuato-acuate, basally spined, skeleton spicula. $\times 264$ linear.

Fig. 4.—An attenuato-acuate, entirely spined, internal defensive spiculum. $\times 308$ linear."

"HYMEDESMIA PULCHELLA, *Bowerbank*."

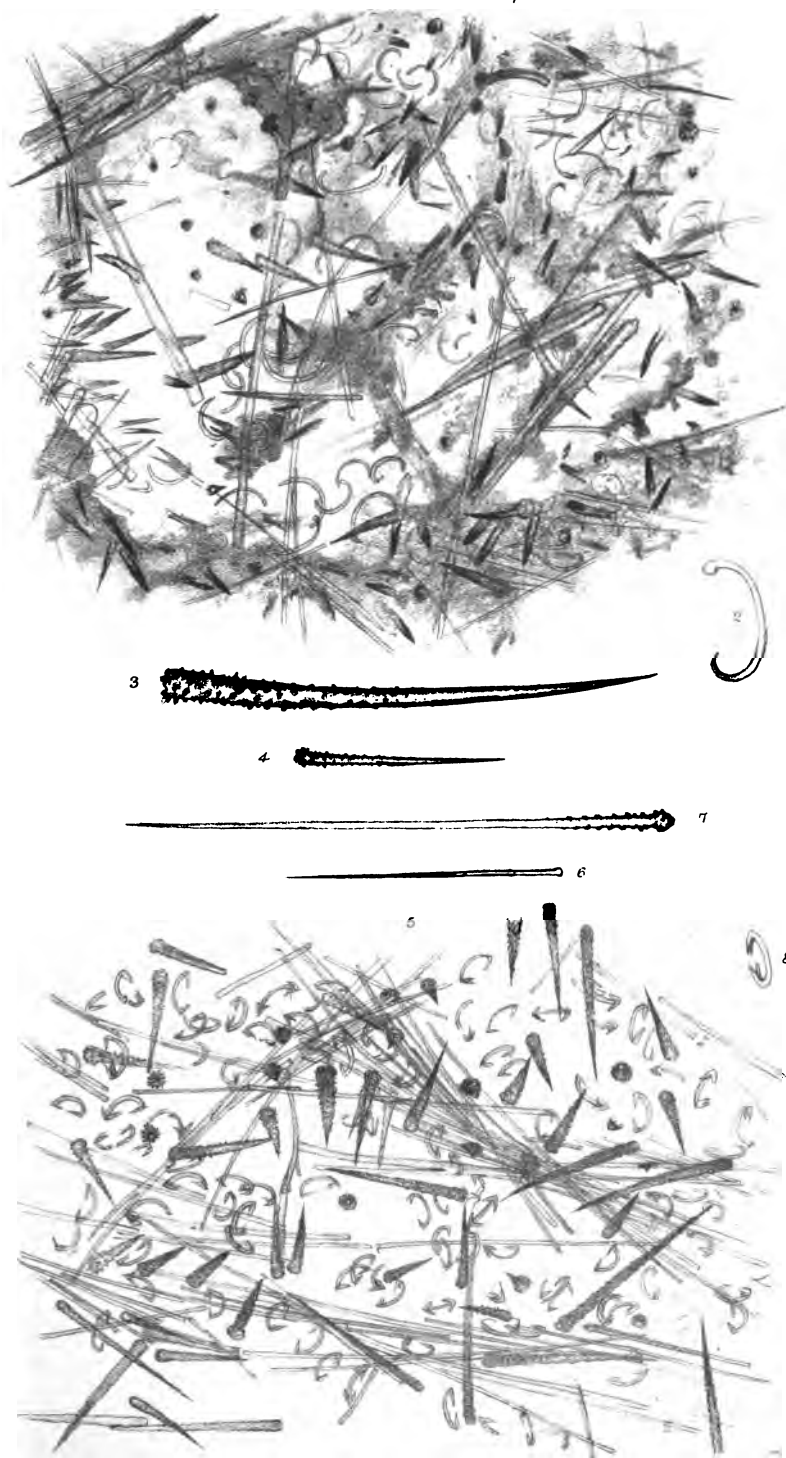
Fig. 5.—A small portion of the type-specimen exhibiting the loosely formed and irregularly disposed fasciculi of the skeleton structures. $\times 264$ linear.

Fig. 6.—One of the slender, attenuato-acuate, skeleton spicula. $\times 420$ linear.

Fig. 7.—A long and slender, attenuato-acuate, basally spinous, skeleton spiculum. $\times 420$ linear.

Fig. 8.—One of the angulated, bidentate, equi-anchorate, retentive spicula. $\times 420$ linear.

Figures of the natural size of both the above-described sponges are omitted, as they would not have assisted in the slightest degree in the discrimination of the species."



Hymedesmia pilata 1-4. *H. pulchella* 5-8.





PLATE III.

"HYMENIACIDON HILLIERI, *Bowerbank*.

Fig. 1.—Represents the sponge in the condition in which it came from the sea. Natural size.

Fig. 2.—A subspinulate spiculum from the skeleton. $\times 158$ linear.

Fig. 3.—An acuate skeleton spiculum. $\times 158$ linear."

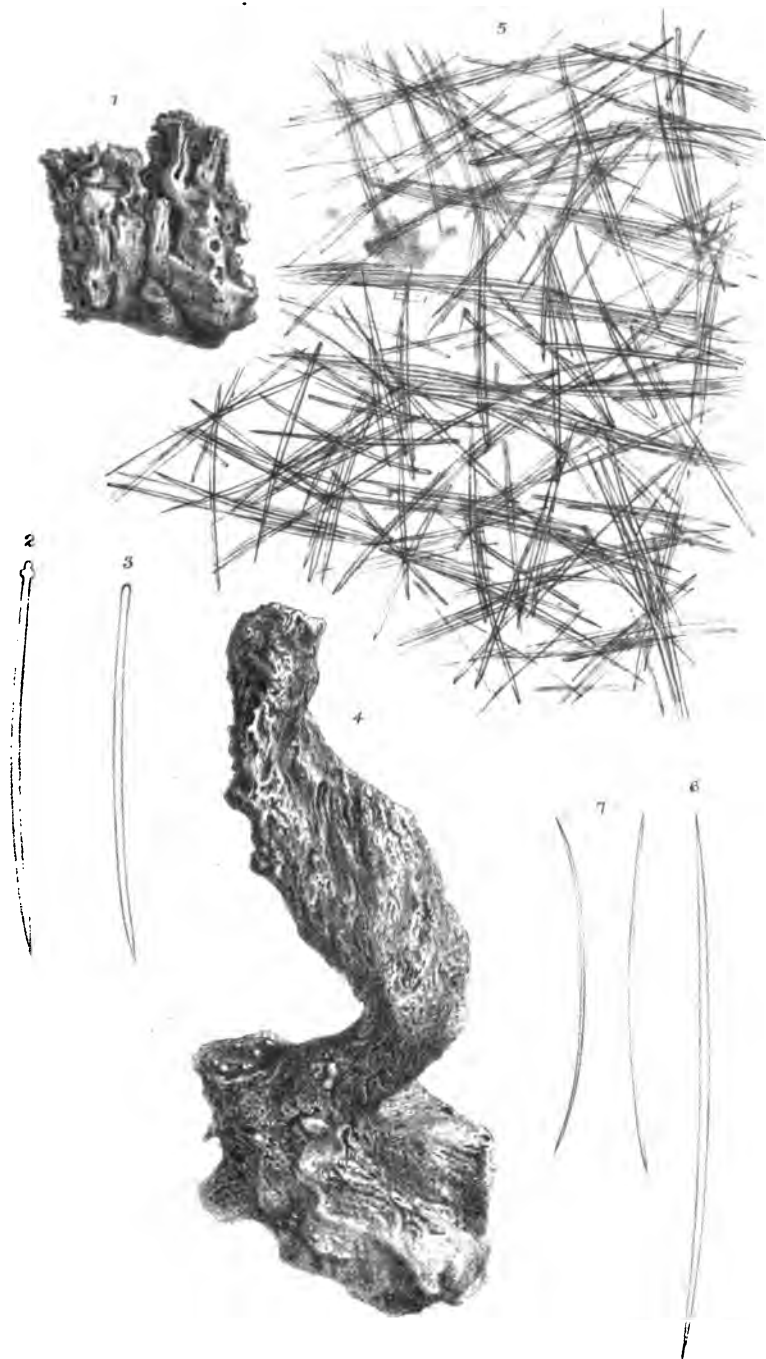
"HYMENIACIDON SOLIDUS, *Bowerbank*.

Fig. 4.—Represents the sponge in the dry state. Natural size.

Fig. 5.—A small portion of the reticulate, dermal membrane. $\times 94$ linear.

Fig. 6.—One of the fusiformi-acerate spicula of the dermal rete and of the skeleton. $\times 158$ linear.

Fig. 7.—Two of the slender acerate spicula of the skeleton. $\times 158$ linear. These spicula are frequently more or less flexuous."

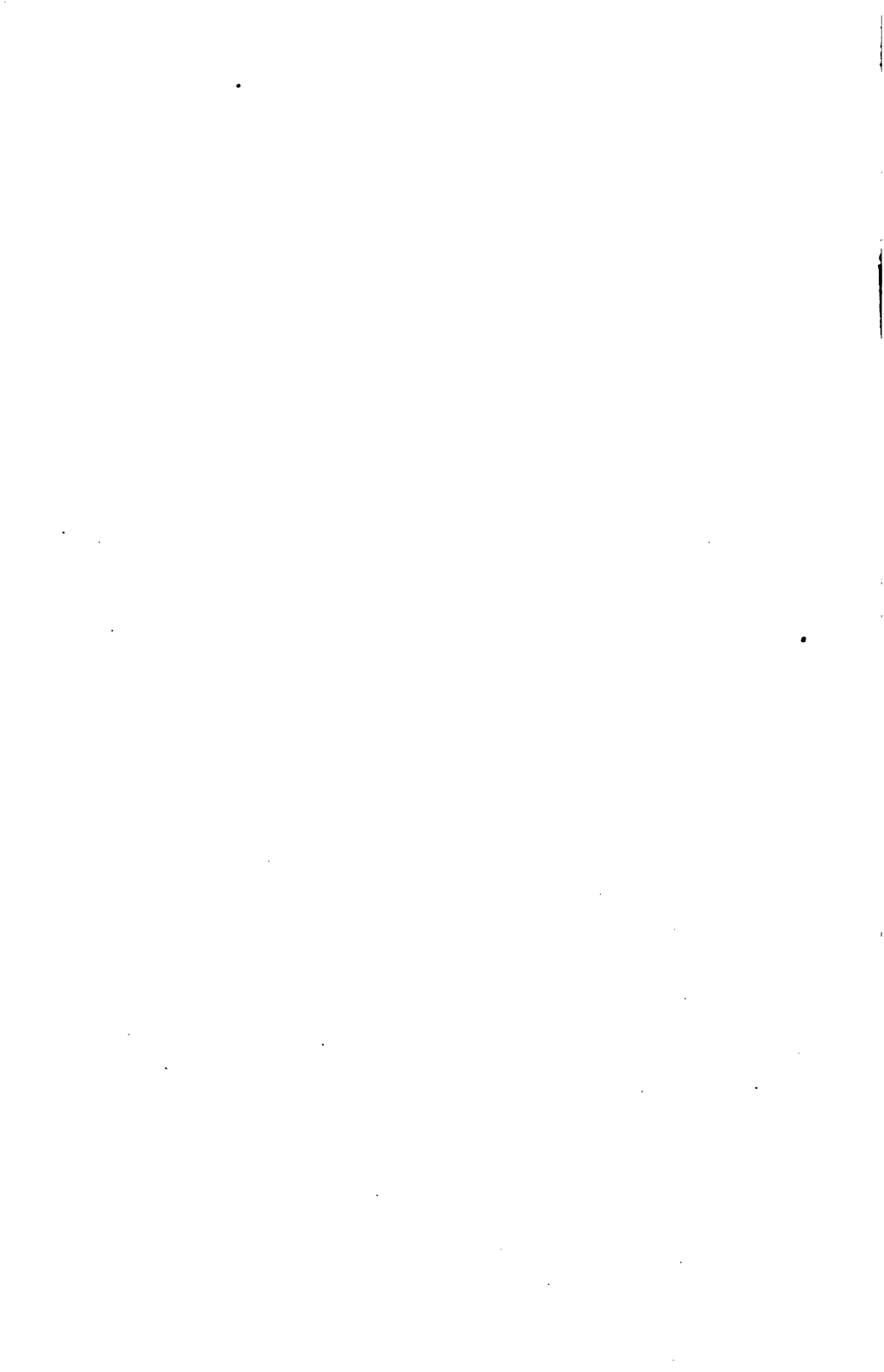


Hymeniacion Hillieri 1-3. H. solidus 4-7.

Dinkel del. et lith.

West & Co imp





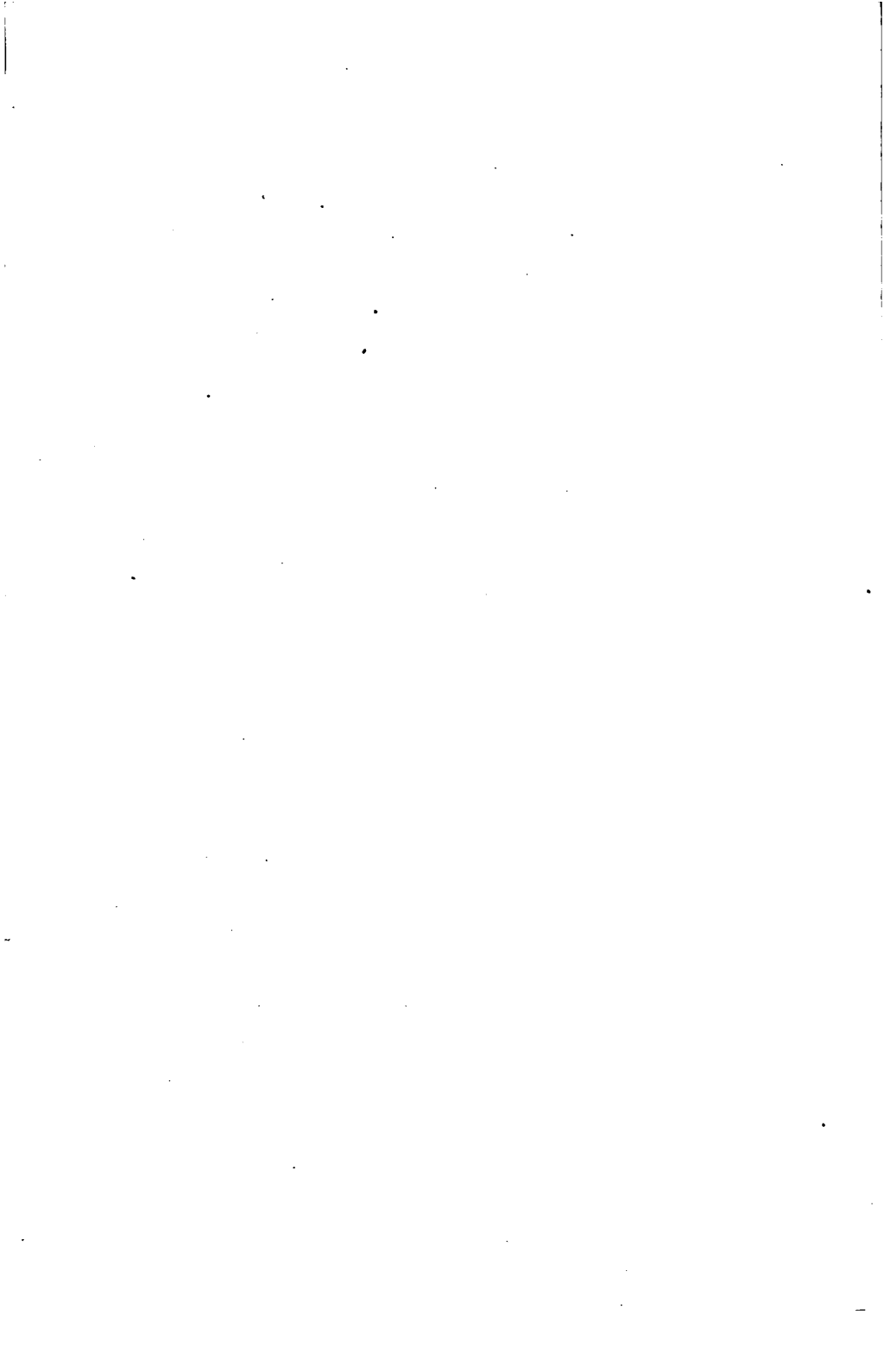


PLATE IV.

ISODICTYA SCITULA, *Bowerbank.*

Figs. 1a, 1b, 1c.—Acuate spicules of the skeleton, to show their variation in size. $\times 150$.

Fig. 2.—One of the bidentate, equi-anchorate, retentive spicula. $\times 800$.

Figs. 3a and 3b.—Angulated bihamate spicula of the dermal membrane, more abundant than the last but not mentioned in the description of the species. $\times 800$.

For figures of the sponge itself see Plate IX, figs. 1—3.

HYMENIACIDON VIRGULATUS, *Bowerbank.*

Fig. 4.—The sponge. Natural size.

Fig. 5.—One of the long, slender, acuate spicula of the skeleton. $\times 150$.

HYMENIACIDON CALLOSUS, *Bowerbank.*

Figs. 6 and 7.—The type-specimens of the sponge. Natural size.

Fig. 8.—One of the acuate spicula of the skeleton. $\times 150$.

[Fig. 9.—A hydroid zoophyte, parasitical on *H. callosus*, and inserted in the Plate by the engraver by mistake.]

HYMENIACIDON ARMIGER, *Bowerbank.*

Fig. 10.—*Hymeniacidon armiger*. Natural size. Thinly coating the basal portion of a specimen of *Nullipora polymorpha*.

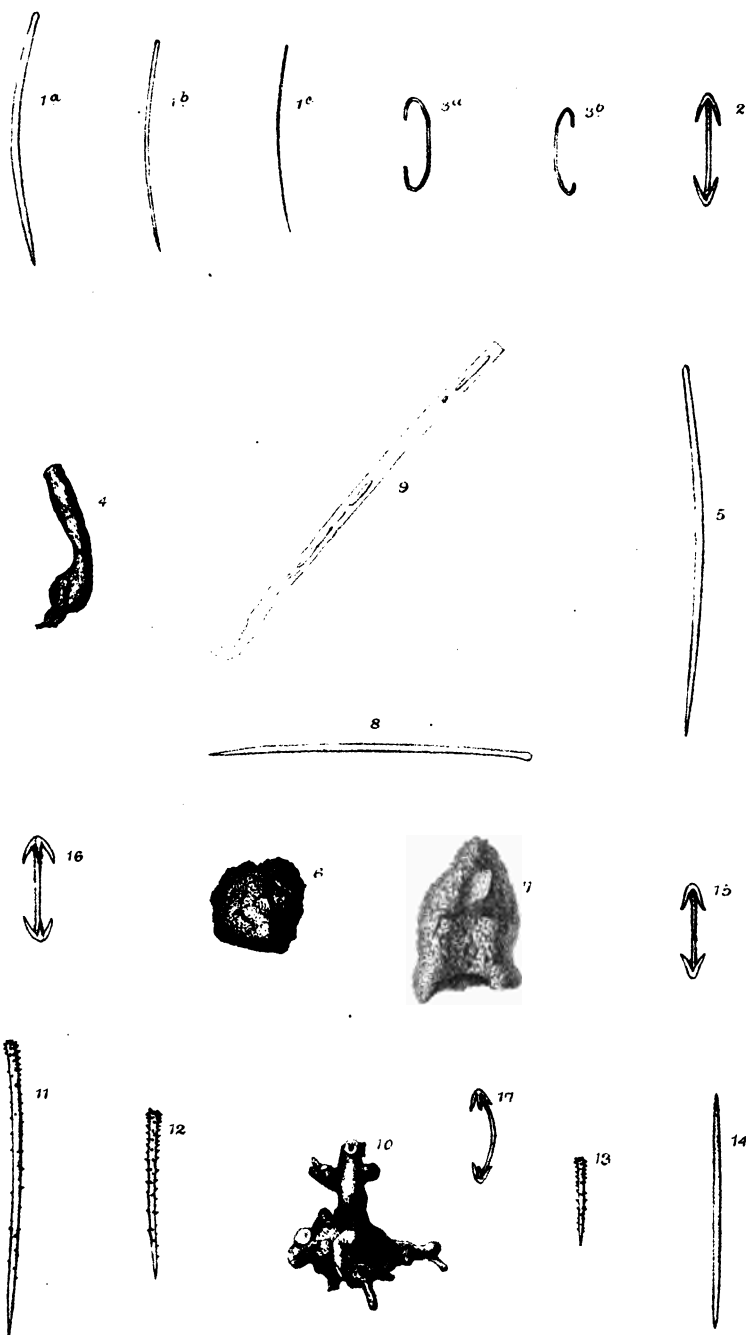
Figs. 11, 12 and 13.—Attenuato-acuate, entirely spined, dermal spicules, showing their variability in size. $\times 150$.

Fig. 14.—A fusiformi-acerate spicule of the skeleton. $\times 150$.

Fig. 15.—A bidentate equi-anchorate spicule of the dermal membrane. $\times 800$.

Figs. 16 and 17. Tridentate, equi-anchorate, retentive spicula. $\times 800$.

Plate IV.



Isodictya scitula 1-3. *Hymeniacion virgulatus* 4-5.
Hymeniacion callosus 6-8. *Hymeniacion armiger* 10-17.



PLATE V.

"*HALICHONDRIA VIRGEA*, *Bowerbank*."

Figs. 1 and 2.—Represent the largest of the four specimens of the species sent to me by Mr. Norman. Natural size.

Fig. 3.—A small portion of the dermal membrane, exhibiting the mode of the fasciculation of the spicula. $\times 264$ linear.

Fig. 4.—One of the subfusiform, basally spinous, acuate, skeleton spicula. $\times 264$ linear.

Fig. 5.—A long and slender, acuate, tension spiculum from the dermal membrane. $\times 264$ linear.

Fig. 6.—A large bidentate, equi-anchorate, retentive spiculum from the dermal membrane. $\times 400$ linear.

Fig. 7.—One of the small and numerous bidentate, equi-anchorate, retentive spicula. $\times 400$ linear."

"*HALICHONDRIA ROBERTSONI*, *Bowerbank*."

Fig. 8.—Represents the sponge in the dried state. Natural size.

Fig. 9.—A small portion of the dermal membrane, exhibiting the broad, flat, irregularly dispersed fasciculi of the dermis. $\times 94$ linear.

Fig. 10.—A fully-developed, hastate, cylindrical spiculum from the dermal membrane. $\times 264$ linear.

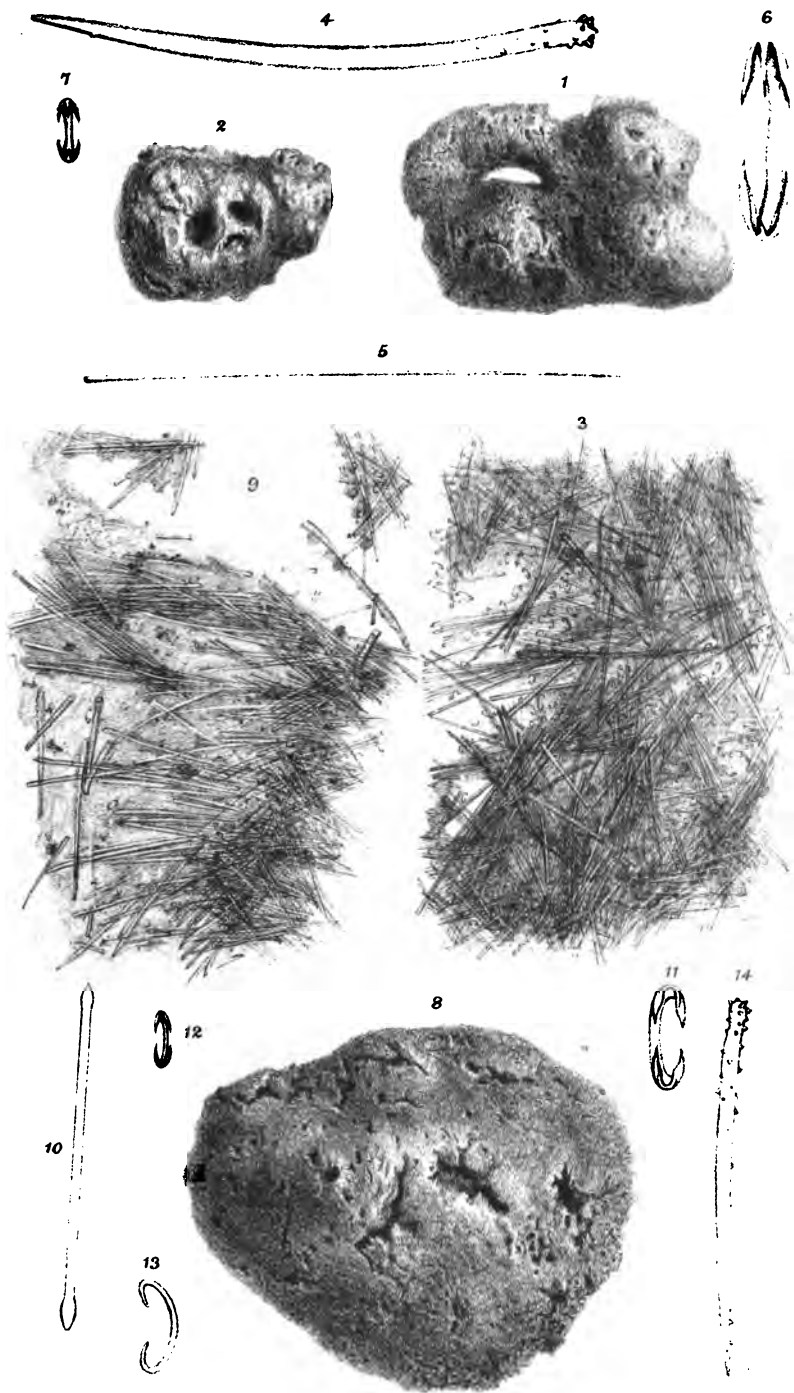
Fig. 11.—One of the largest of the tridentate, equi-anchorate, retentive spicula from the dermal membrane. $\times 400$ linear.

Fig. 12.—One of the smallest tridentate, equi-anchorate, retentive spicula from the dermal membrane. $\times 400$ linear.

Fig. 13.—One of the minute and slender, bihamate, retentive spicula from the dermal membrane. $\times 400$ linear.

Fig. 14.—One of the short and stout, basally and apically spined, acuate skeleton spicula. $\times 308$ linear."

Plate V.



Dinkel del et lith.

West & Co. imp.

Halichondria virgea 1-7. *H. Robertsoni* 8-14.



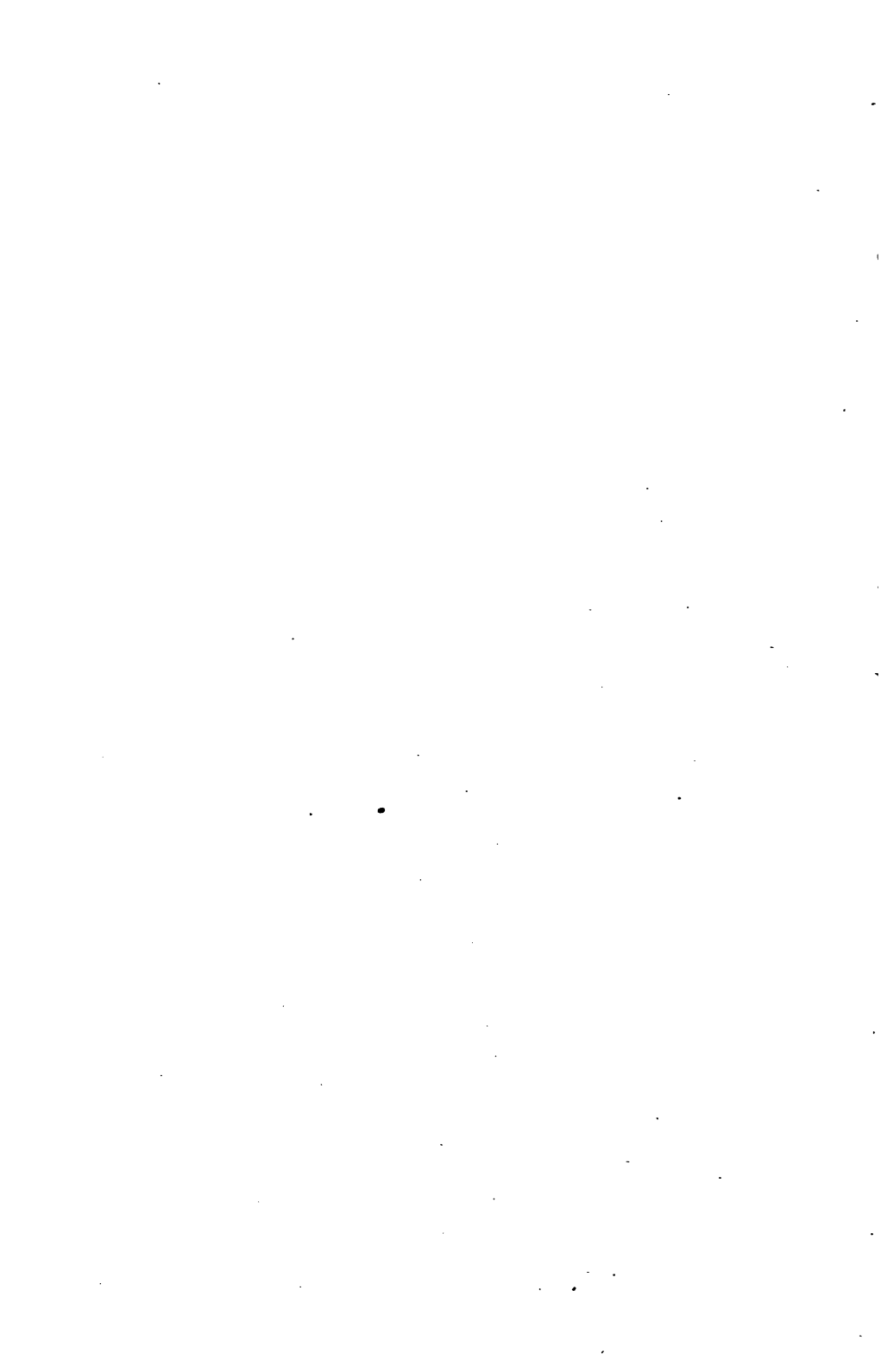




PLATE VI.

“HALICHONDRIA CONDENSEA, *Bowerbank*.”

Fig. 1.—Represents the sponge based on a small fragment of a bivalve shell. Natural size.

Fig. 2.—A small portion of the dermal membrane exhibiting the unispiculous structure of its rete. $\times 94$ linear.

Fig. 3.—One of the short, stout, acerate spicula of the skeleton. $\times 160$ linear.”

“HALICHONDRIA CYLINDRACEA, *Bowerbank*.”

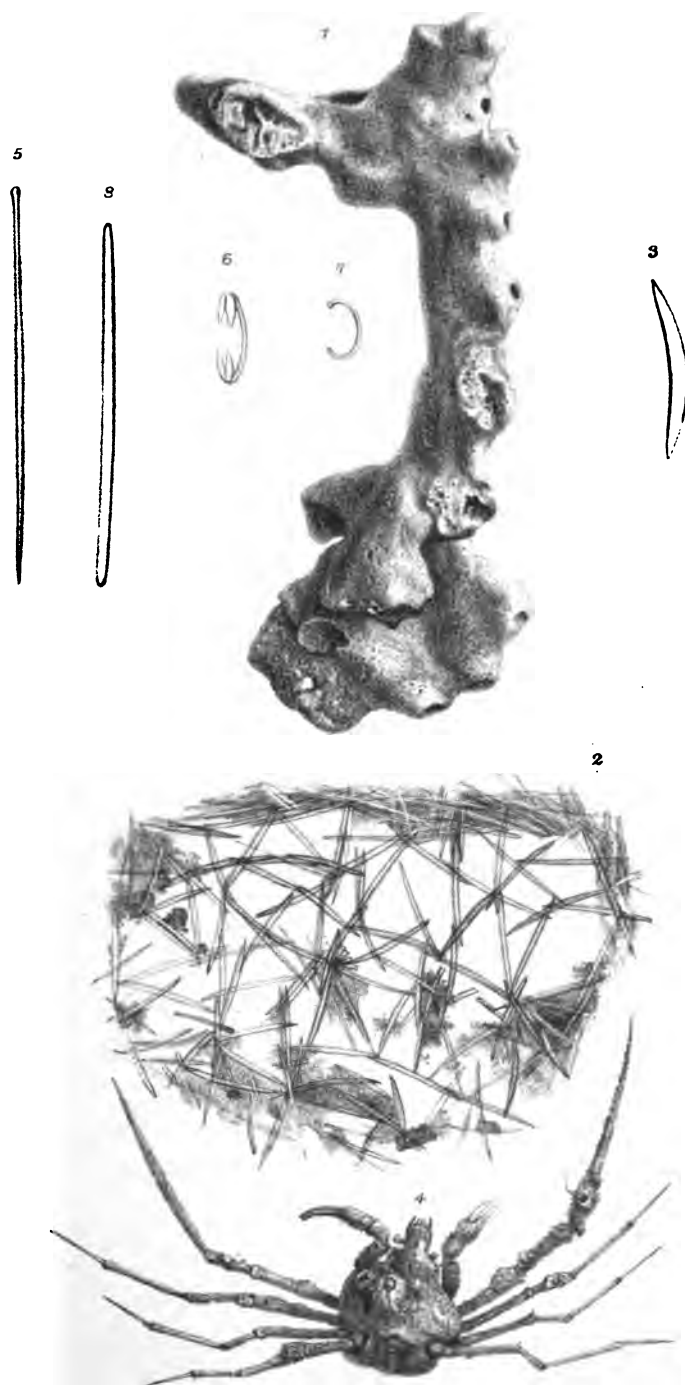
Fig. 4.—Represents the sponge covering nearly the whole of the carapace of a specimen of *Inachus Dorsetensis*, and appearing in small patches on some of its legs. Natural size.

Fig. 5.—One of the subcylindrical acerate spicula of the dermal membrane. $\times 264$ linear.

Fig. 6.—A bidentate, equi-anchorate, retentive spiculum from the dermal membrane. $\times 425$ linear.

Fig. 7.—One of the small, slender, bihamate, retentive spicula from the dermal membrane. $\times 425$ linear.

Fig. 8.—One of the subcylindrical, acerate skeleton spicula. $\times 264$ linear.”



Halichondria condensata 1-3. *H. cylindracea* 4-8.

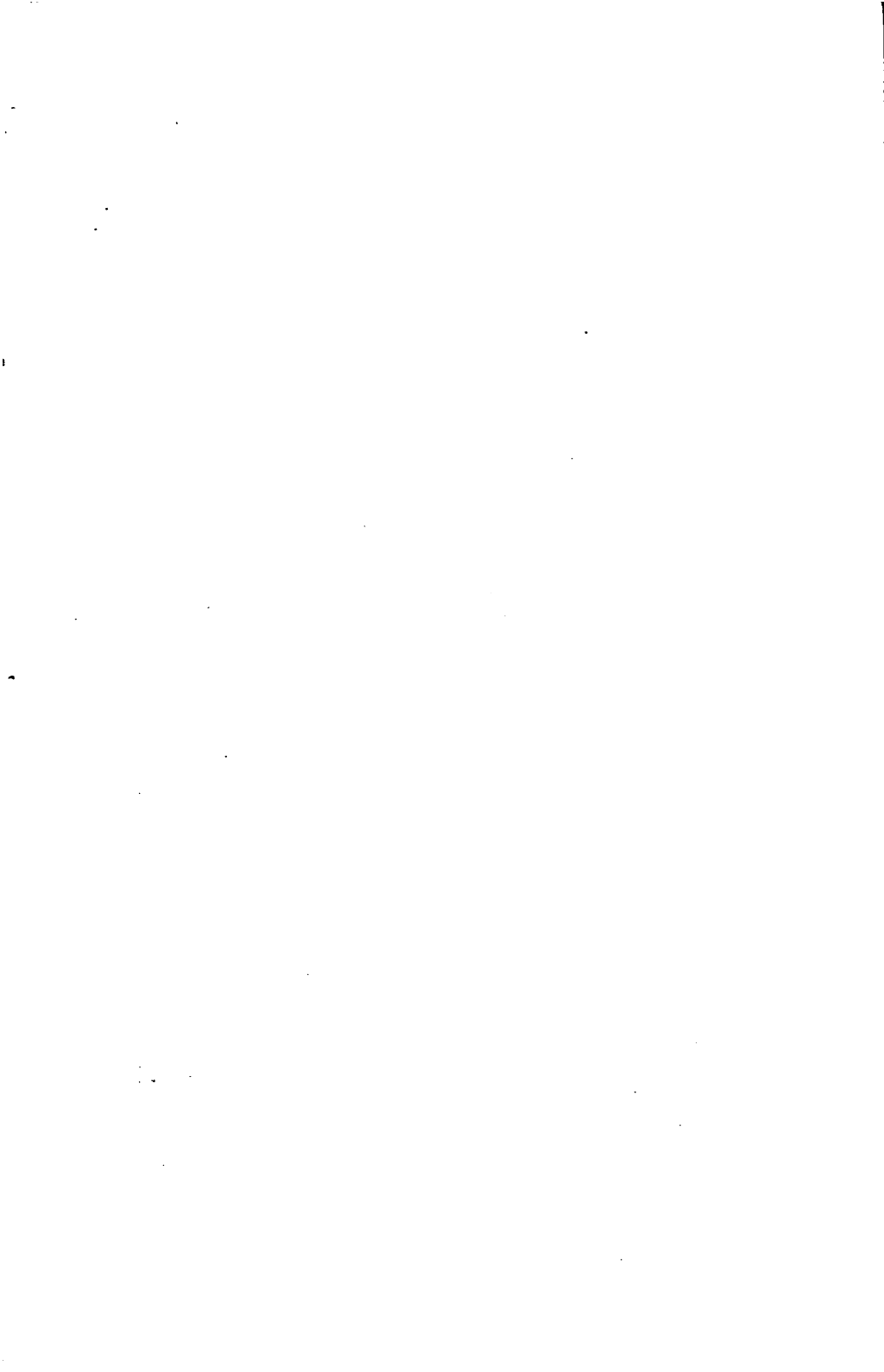


PLATE VII.

“HALICHONDRIA CORALLOIDES, *Bowerbank*.

Fig. 1.—Represents the sponge of the natural size.

Fig. 2.—A small portion of the dermal membrane exhibiting the fasciculated structure of its rete. \times 80 linear.

Fig. 3.—One of the acerate skeleton spicula. \times 150 linear.”

“HALICHONDRIA FLABELLIFERA, *Bowerbank*.

Fig. 4.—Represents the sponge enveloping nearly the whole of a specimen of *Nullipora polymorpha*, natural size.

Fig. 5.—A small portion of the dermal membrane showing the more or less fasciculation of its spicula. \times 250 linear.

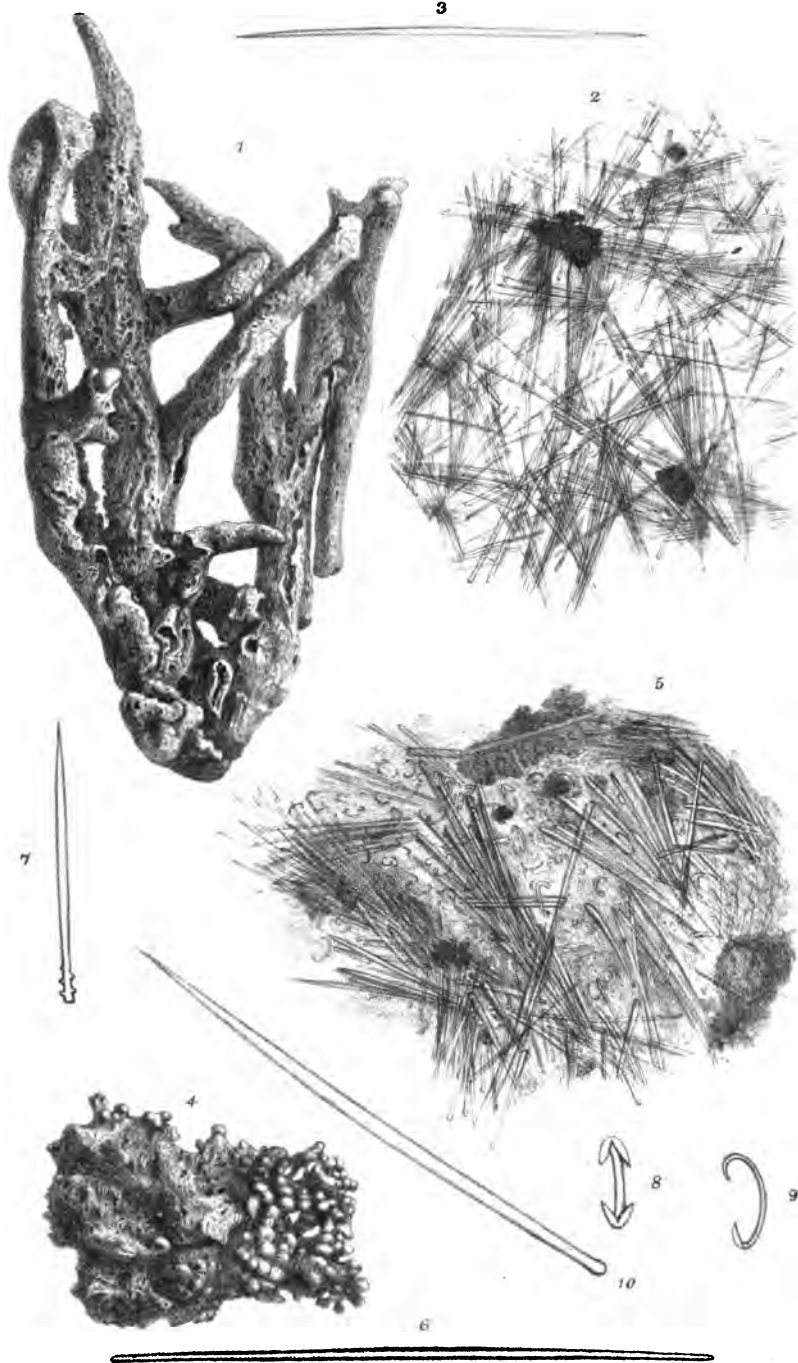
Fig. 6.—One of the subfusiform cylindrical tension spicula of the dermal membrane. \times 420 linear.

Fig. 7.—One of the basally and occasionally apically spinous fusiform, acerate external defensive spicula. \times 240 linear.

Fig. 8.—A bidentate, equi-anchorate, retentive spiculum from the dermal membrane. \times 420 linear.

Fig. 9.—One of the bidentate, retentive spicula from the dermal membrane. \times 420 linear.

Fig. 10.—A fusiformi-acuate skeleton spiculum. \times 420 linear.”



Halichondria coralloides 1-3. *H. flabellifera* 4-10.

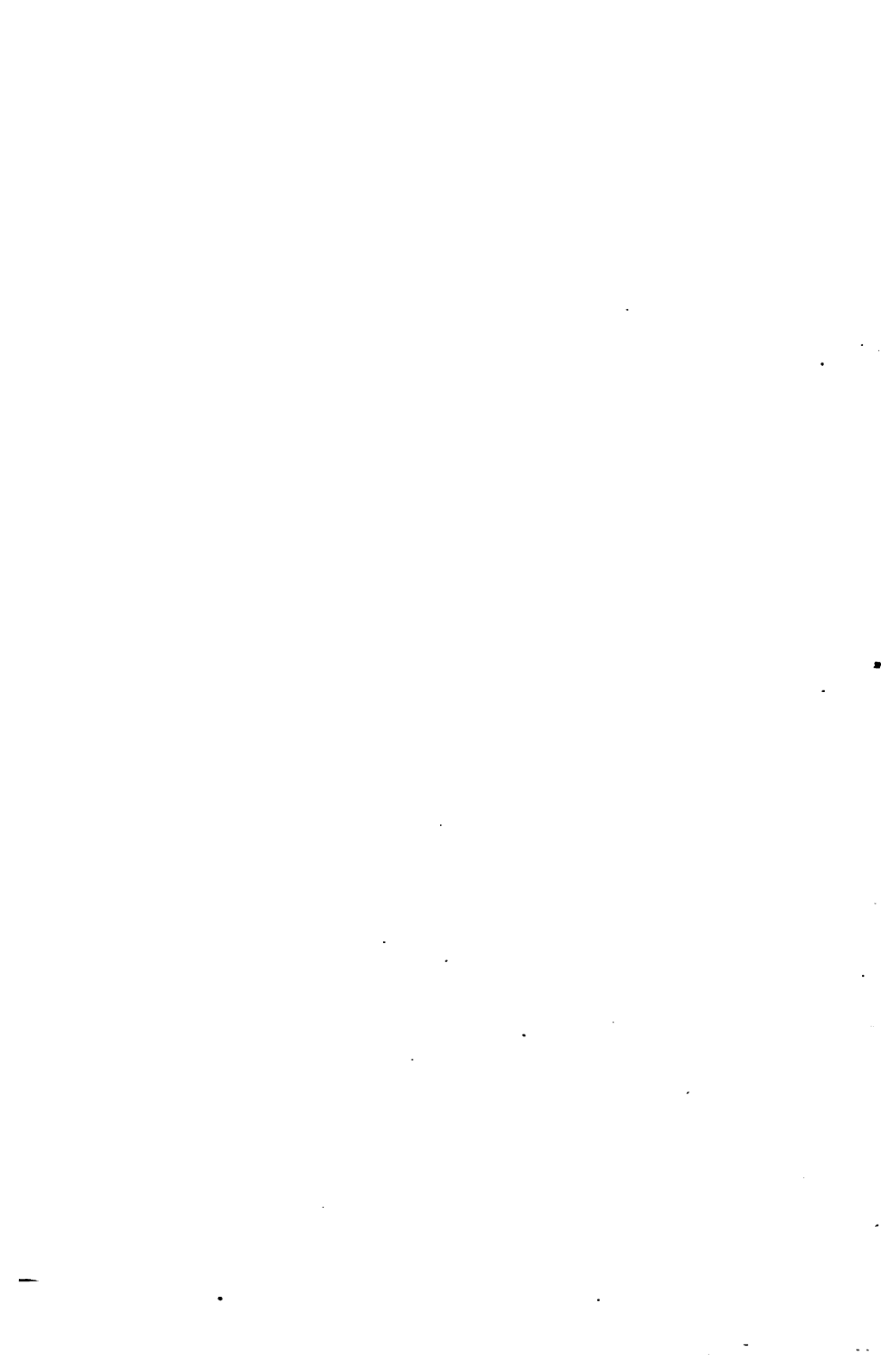




PLATE VIII.

"ISODICTYA FERULA, *Bowerbank*."

Figs. 1 and 2.—Represent the type-specimens of the species. Natural size.

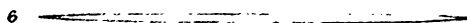
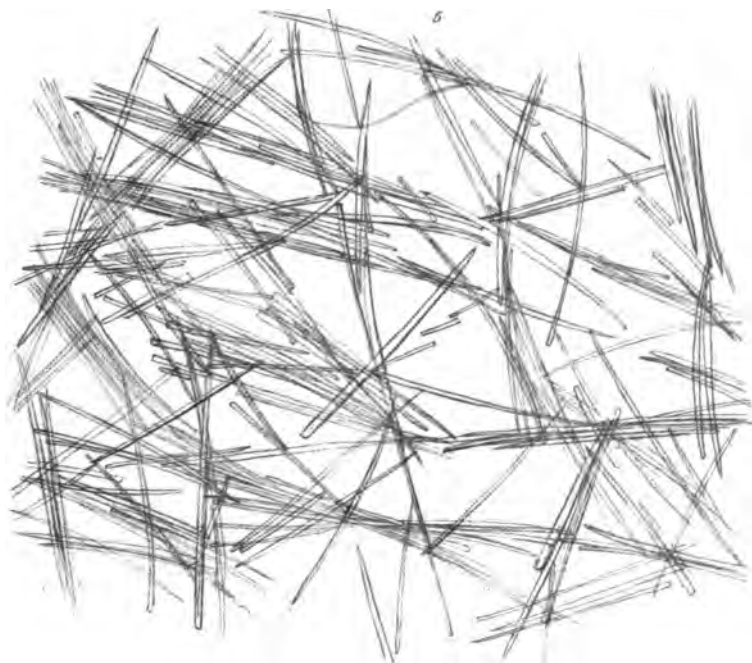
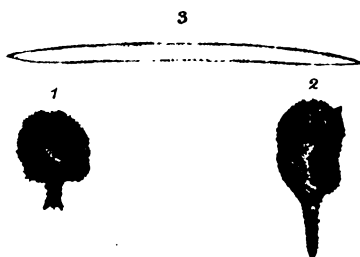
Fig. 3.—A skeleton spiculum. $\times 264$ linear."

"ISODICTYA CRASSA, *Bowerbank*."

Fig. 4.—Represents the type-specimen. Natural size.

Fig. 5.—A small portion of the dermal membrane, exhibiting its reticulated structure.

Fig. 6.—A skeleton spiculum."

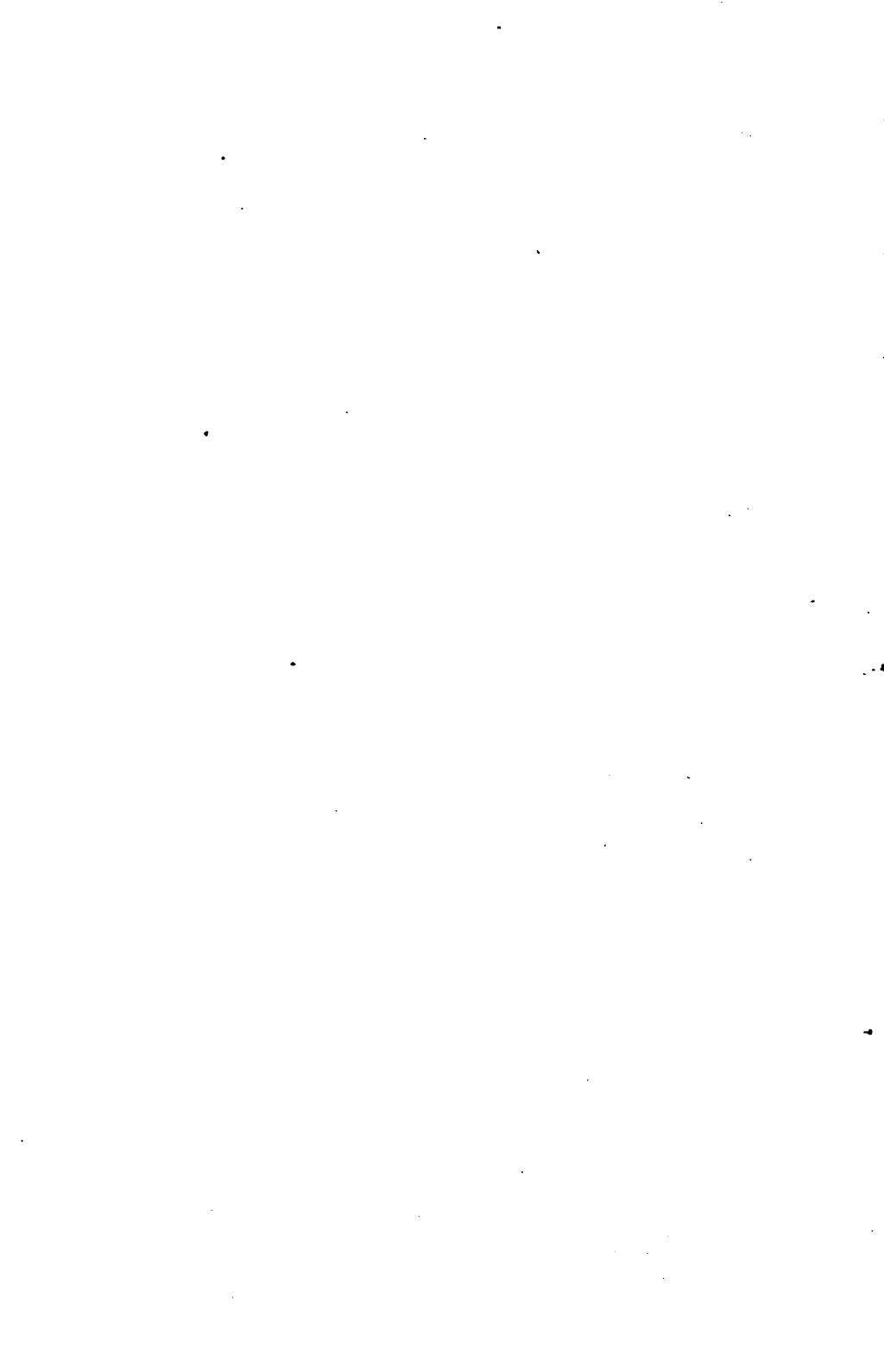


J. Dinkel del et lith.

West & Co. imp.

Isodictya ferula, 1-3. *I. crassa*, 4-6.





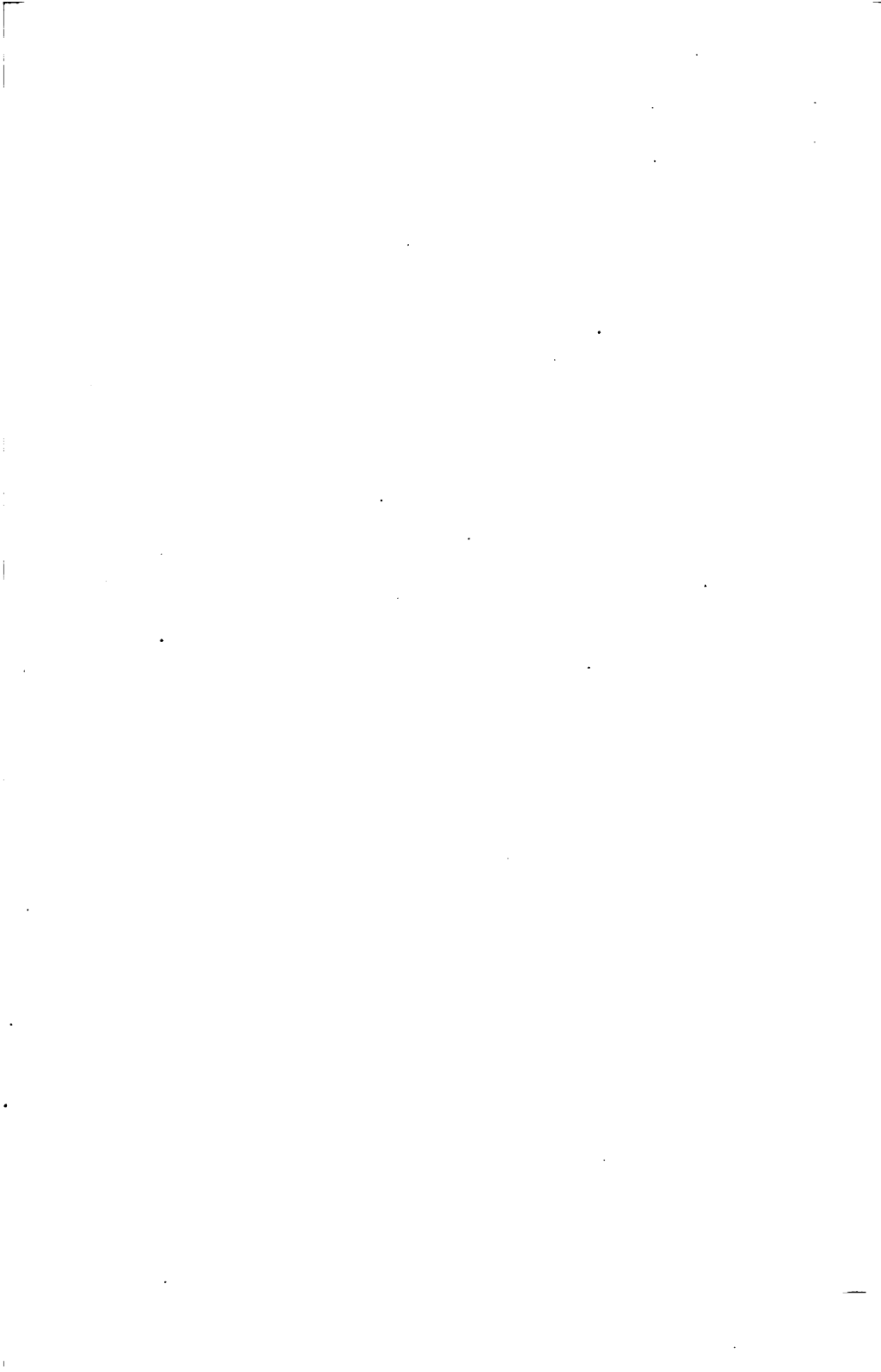


PLATE IX.

ISODICTYA SCITULA, *Bowerbank.*

Figs. 1, 2 and 3.—Specimens of the sponge growing on *Nullipora polymorpha*. Natural size.

For figures of the spicula of this sponge see Plate IV, figs. 1—3.

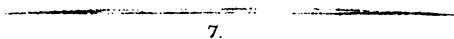
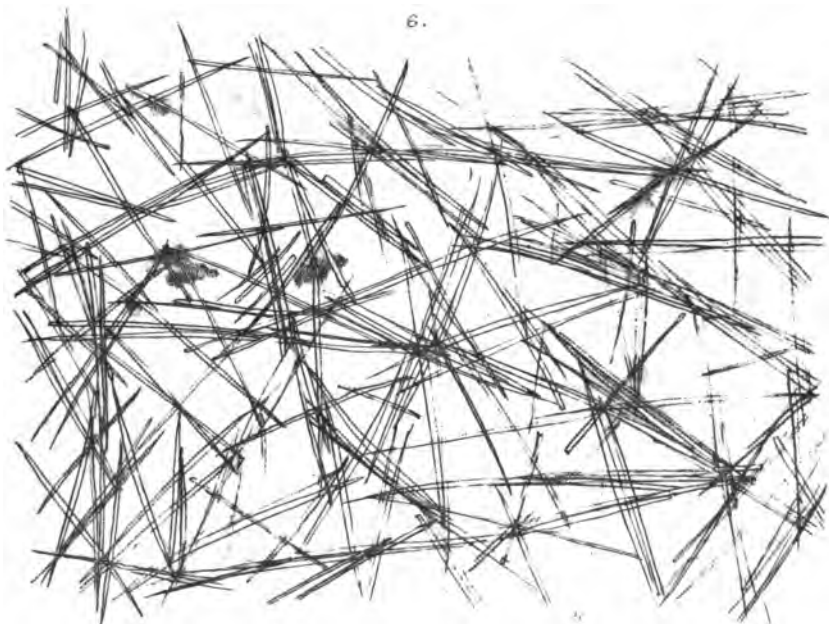
ISODICTYA PERPLEXA, *Bowerbank.*

Figs. 4 and 5.—Represent the type specimens of the sponge coating *Nullipora polymorpha* of the natural size.

Fig. 6.—A portion of the dermal membrane.

Fig. 7.—One of the long fusiformi-acerate spicules of the skeleton.

Plate IX.



Isodictya scitula 1-3. *Isodictya perplexa* 4-7.





PLATE X.

ISODICTYA INVOLUTA, *Bowerbank*.

Fig. 1.—The type growing on *Nullipora polymorpha*. From Westport Bay. In the collection of the Rev. A. M. Norman.

Fig. 2.—A portion of the dermal membrane.

Fig. 3.—One of the slender, acuate, tension spicula.

Fig. 4.—One of the stout acuate spicula of the skeleton.

ISODICTYA PAUPERCUA, *Bowerbank*.

Fig. 5.—The type on the inside of a valve of *Pecten varius*. From Birterbuy Bay. In the cabinet of the Rev. A. M. Norman.

Fig. 6.—A portion of the sparingly spiculous dermal membrane.

Fig. 7.—Very slender acerate spicule of the dermal membrane.

Fig. 8.—One of the stout acerate spicula of the skeleton.

[Fig. 9.—This Plate was engraved before Dr. Bowerbank's death, but not lettered; nor was any description of it to be found among the author's papers. The bidentate equi-anchorate spicula (Fig. 9) is of very unusual form, but no such spicula is referred to in the descriptions of the two sponges which are illustrated in this Plate.]

Plate X.



Isodictya involuta 1-4. *Isodictya paupercula* 5-8.

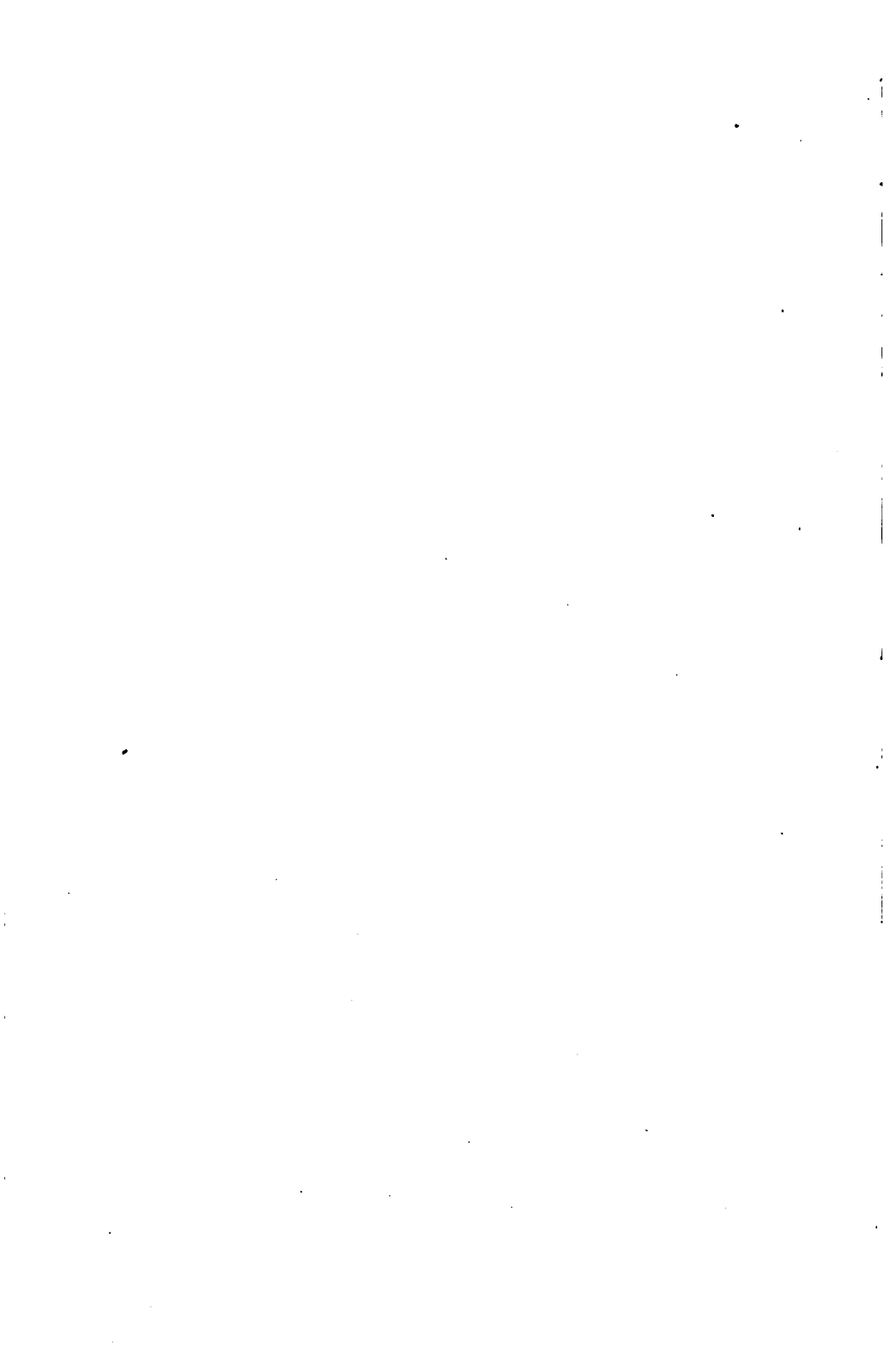




PLATE XI.

“MICROCIONA TUMULOSA, *Bowerbank*.

Figs. 1, 2.—Represent the type-specimens of the species. Natural size.

Fig. 3.—A small portion of the skeleton structure of the sponge exhibiting the irregular mode of the disposition of the slender, compact, skeleton columns and the interstitial spicula dispersed amid them. $\times 94$ linear.

Fig. 4.—One of the skeleton spicula. $\times 264$ linear.”

“ISODICTYA TRUNCA, *Bowerbank*.

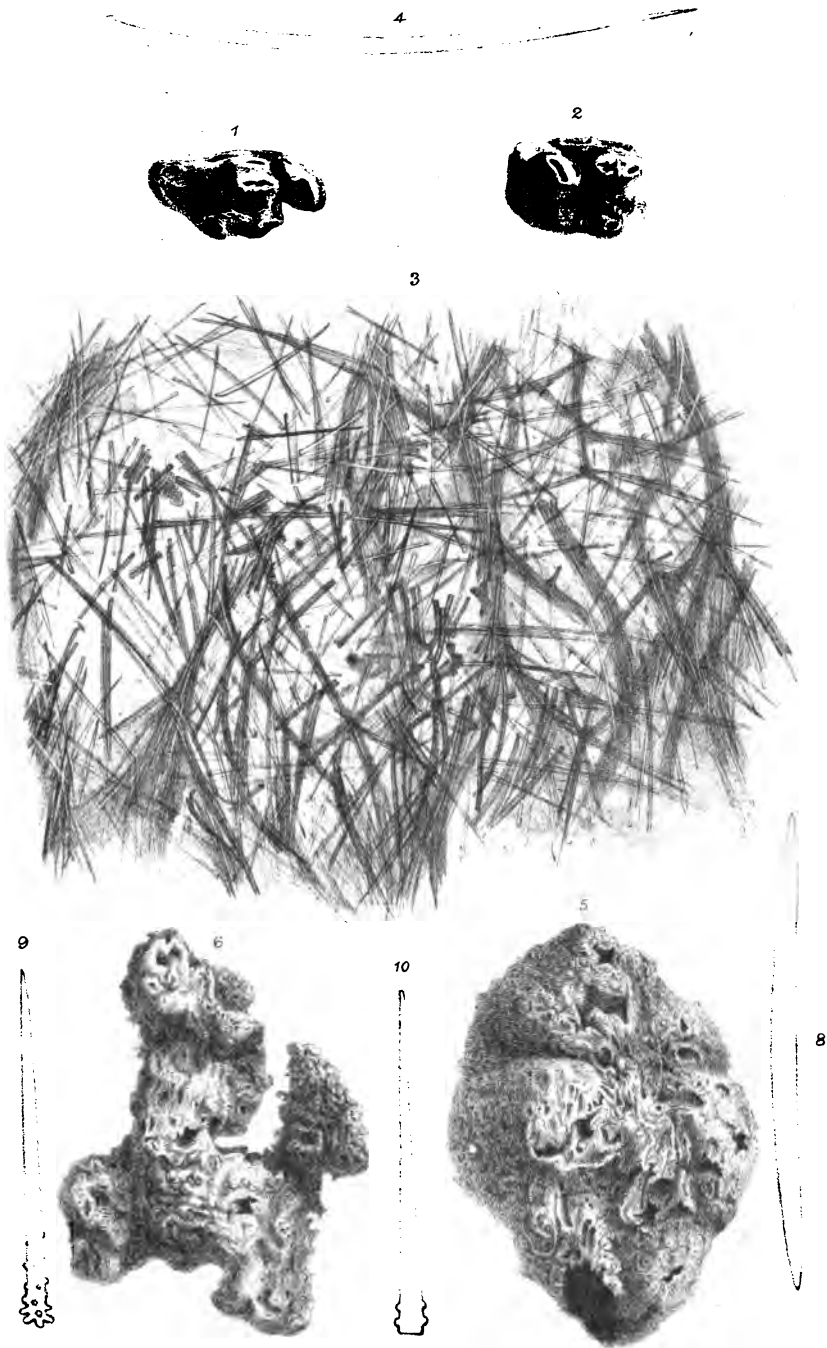
Fig. 5.—The type-specimen of the species. Natural size.

Fig. 6.—A specimen of the species exhibiting a considerable variation in form. Natural size.

Fig. 7.—One of the slender, acerate, dermal tension spicula. $\times 666$ linear.

Fig. 8.—A subfusiformi-acerate, skeleton spiculum. $\times 666$ linear.

Figs. 9, 10.—Two of the attenuato-acuate, internal, defensive spicula, exhibiting the variations in form and basal spination of their truncated bases. $\times 1166$ linear.”



Microciciona tumulosa 1-4. *Isodictya trunca* 5-10.
J. Dinohel del. et lith. *West & Co. inc.*



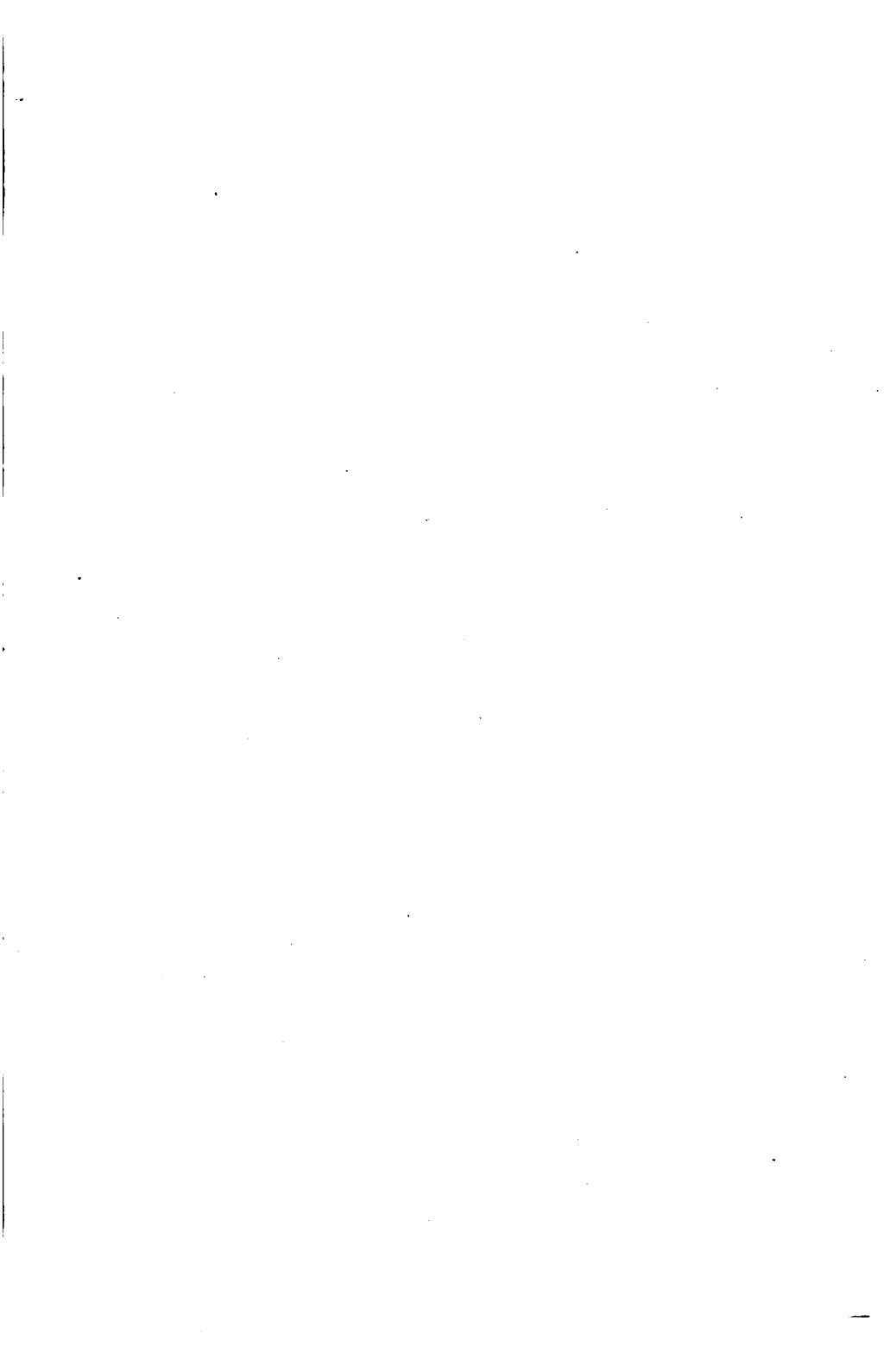


PLATE XII.

ISODICTYA HISPIDA, *Bowerbank*.

Figs. 1 and 2.—The typical specimens on *Nullipora polymorpha*. In the Rev. A. M. Norman's collection. Natural size.

Fig. 3.—A section of the dermis at right angles to the surface.

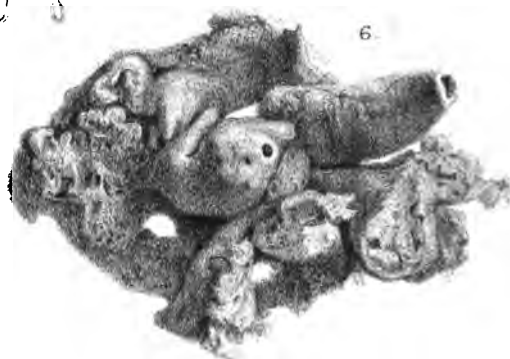
Fig. 4.—A slender, acuminate, tension spicule.

Fig. 5.—Two of the bidentate, equi-anchorate, retentive spicula.

ISODICTYA NODOSA, *Bowerbank*.

Fig. 6.—The type from Birterbuy Bay. In the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 7.—One of the subfusiformi acuminate spicula of the skeleton.



6.

7.

Isodictya hispida 1-5. *Isodictya nodosa* 6-7.

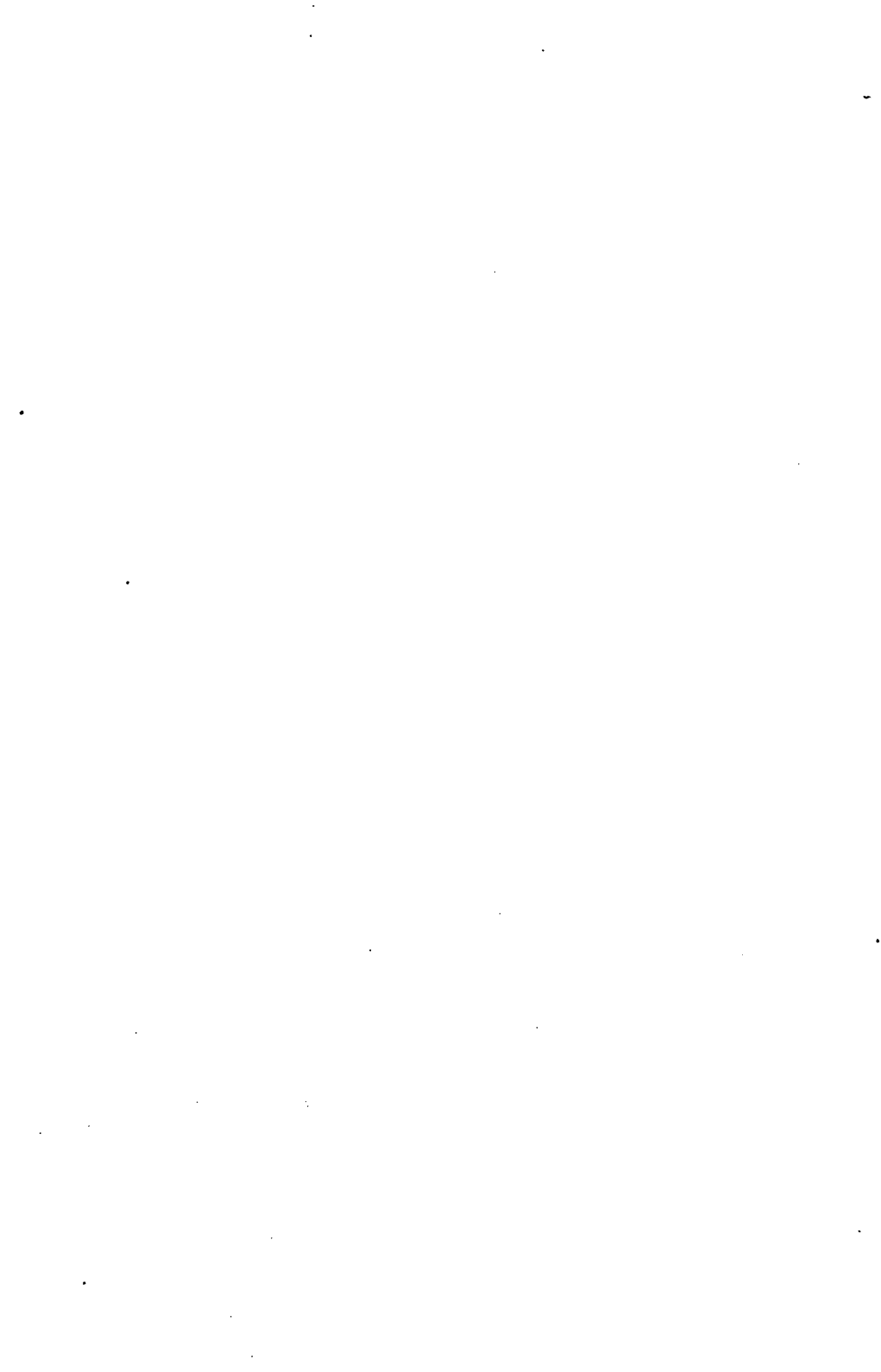




PLATE XIII.

"ISODICTYA PÆTENUIS. *Bowerbank.*

Figs. 1, 2, 3.—Represent the type-specimens of the species. Natural size.

Fig. 4.—One of the slender, acuminate spicula of the skeleton. $\times 425$ linear."

"HYMEDESMIA PEACHII, *Bowerbank.*

Fig. 5.—Represents the small, angular, dark-coloured stone, the white surfaces on which represent the sponge. Natural size.

Fig. 6.—The fragment of a bivalve shell, the inner surface of which is nearly covered by the sponge. Natural size.

Fig. 7.—A small portion of the sponge from off the little angular stone, exhibiting the mode of the distribution of the skeleton fasciculi and the retentive and large auxiliary skeleton spicula. $\times 264$ linear.

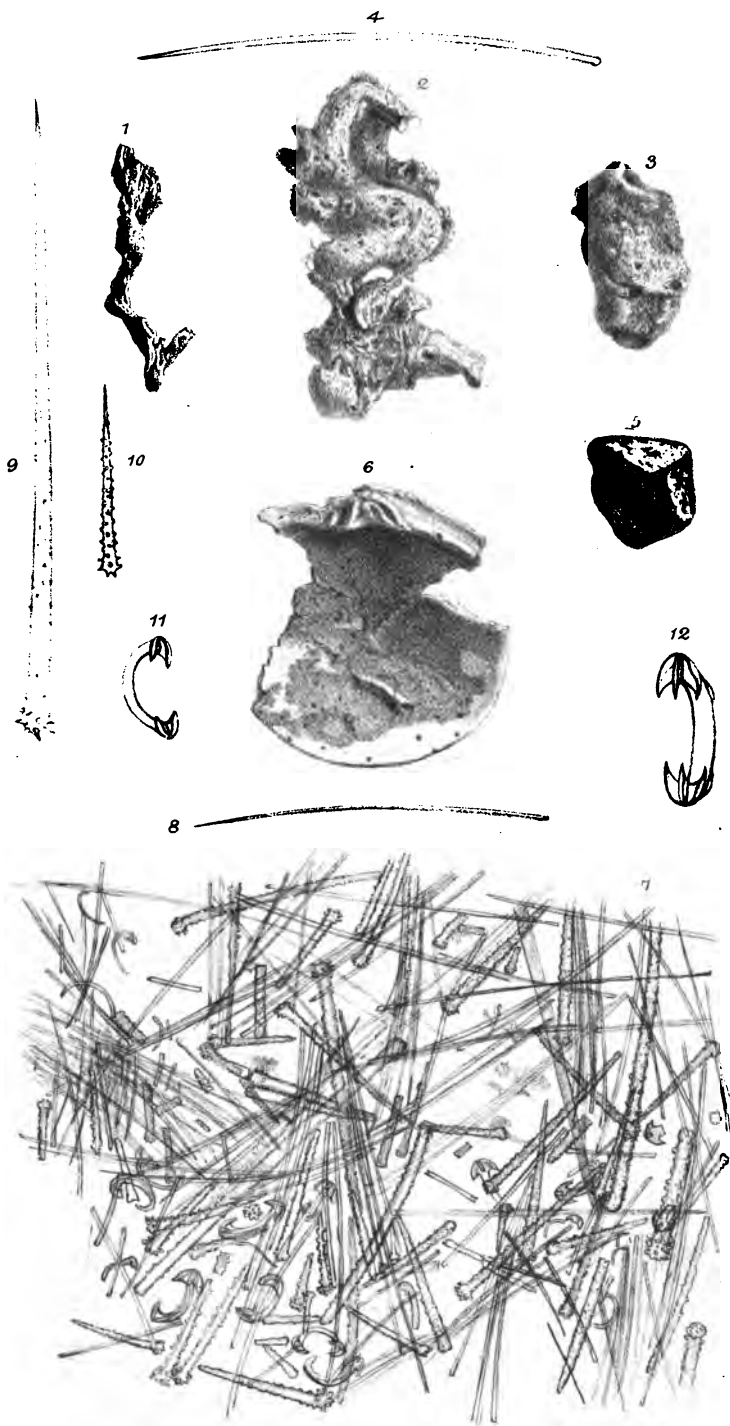
Fig. 8.—One of the slender skeleton spicula from a fasciculus. $\times 264$ linear.

Fig. 9.—A large attenuato-acuminate, basally spinous, auxiliary skeleton. $\times 264$ linear.

Fig. 10.—An internal, defensive, attenuato-acuminate, entirely spined spiculum. $\times 264$ linear.

Fig. 11.—One of the small, bidentate, equi-anchorate, retentive spicula. $\times 425$ linear.

Fig. 12.—A large, tridentate, retentive spiculum, highly magnified to distinctly exhibit the slender central tooth at each termination. $\times 666$ linear."



Isodictya pertenuis 1-4. *Hymedesmia Peachii* 5-12
J. Dinkel del et lith.



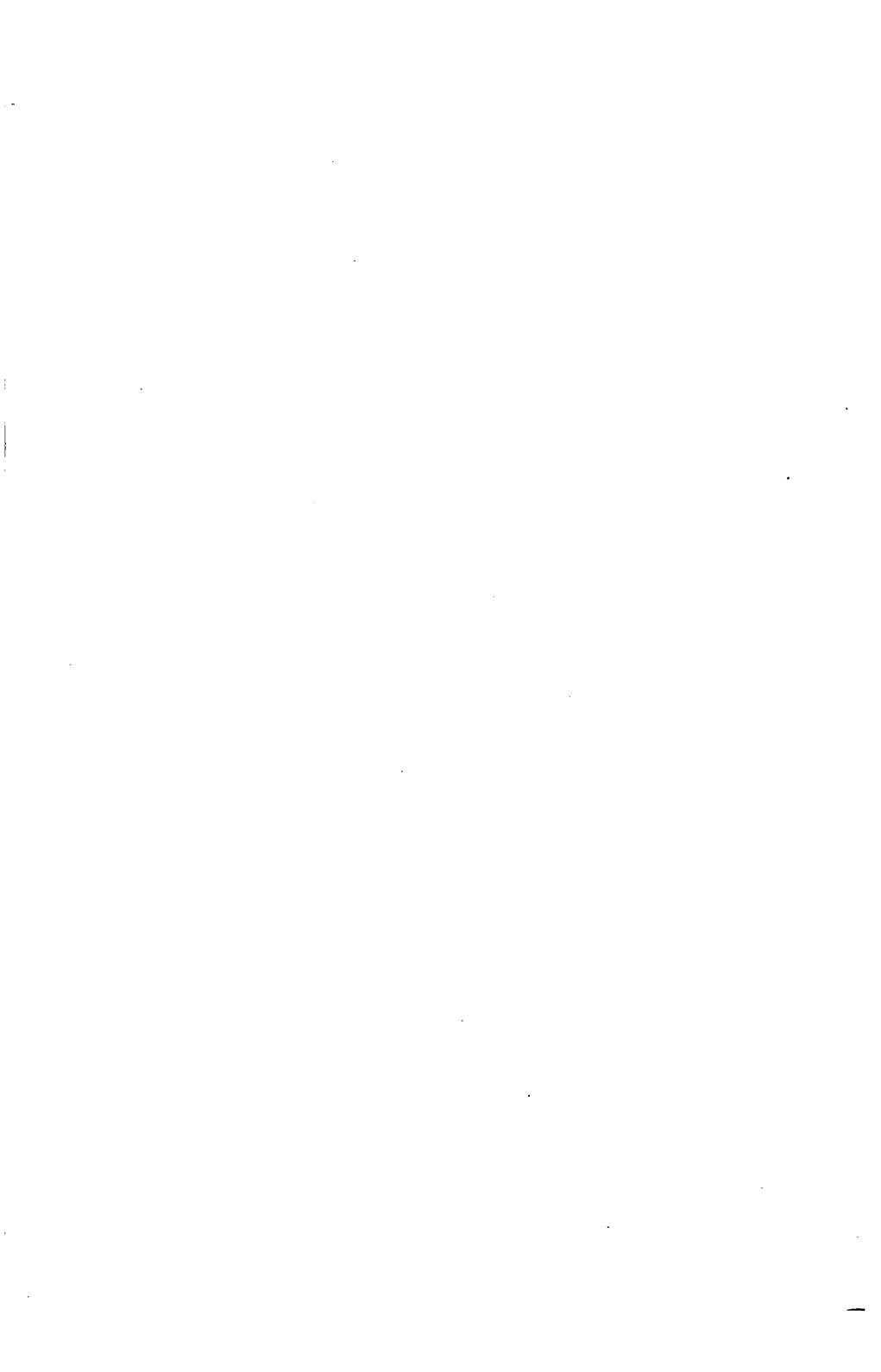


PLATE XIV.

ISODICTYA DEFORMIS, *Bowerbank.*

Fig. 1.—Mr. Peach's type-specimen on the inside of a valve of *Mytilus edulis*. From Wick.

Fig. 2.—A portion of the dermal membrane.

Fig. 3.—An incipiently spined acuate spicule of the skeleton.

Fig. 4.—One of the very minute, simple, bihamate, retentive spicula.

Fig. 5.—One of the equally minute, bidentate-equi-anchorate, retentive spicula.

ISODICTYA COLLINA, *Bowerbank.*

Fig. 6.—The type-specimen attached to a root of *Laminaria*. In the Rev. A. M. Norman's cabinet.

Figs. 7 and 8.—Two other specimens from the same locality.

Fig. 9.—The subfusiformi-acuate spicule of the skeleton.

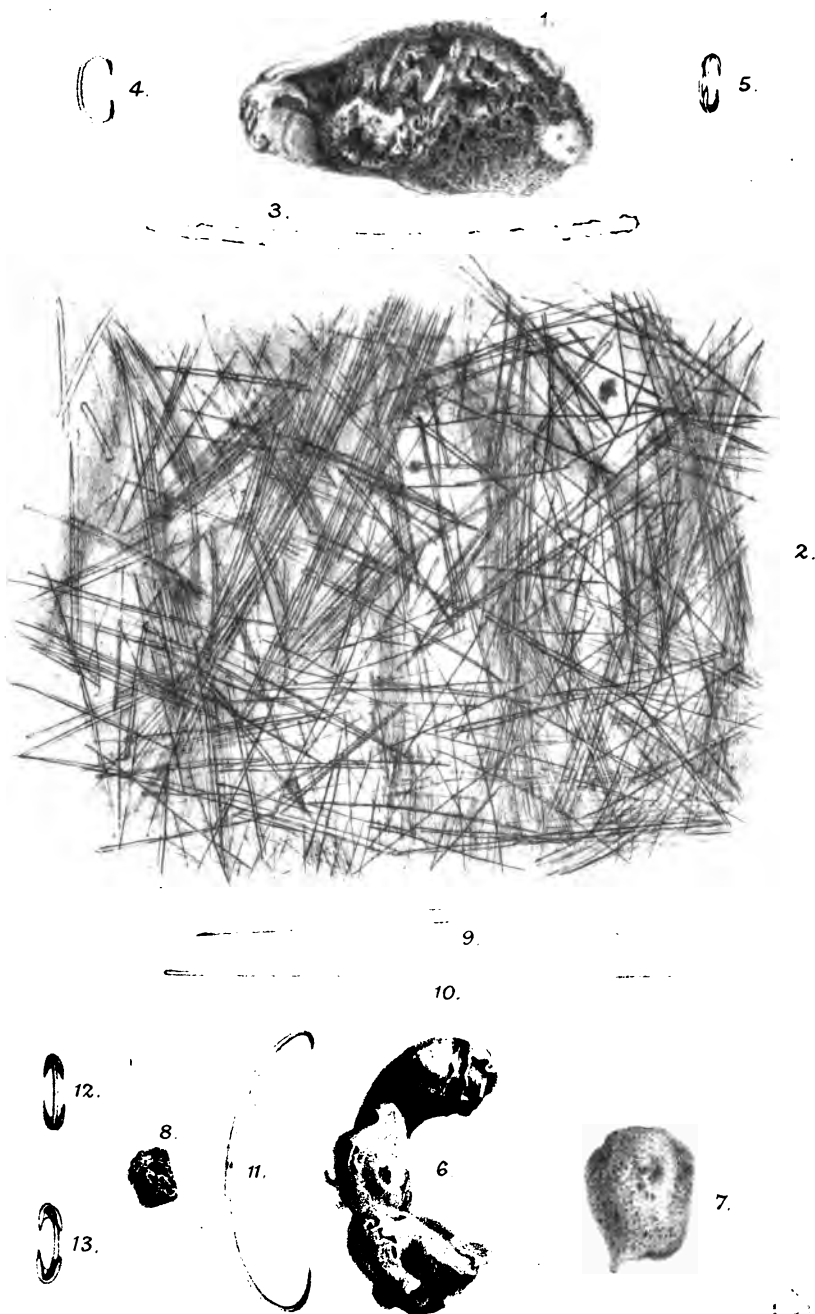
Fig. 10.—One of the long and slender acuate tension spicules.

Fig. 11.—The large and slender, contort, bihamate, retentive spicule.

Fig. 12.—A bidentate equi-anchorate spicule.

Fig. 13.—A dentate palmato-equi-anchorate spiculum.

Plate XIV.



Isodictya deformis. 1-5. *Isodictya collina* 6-13.

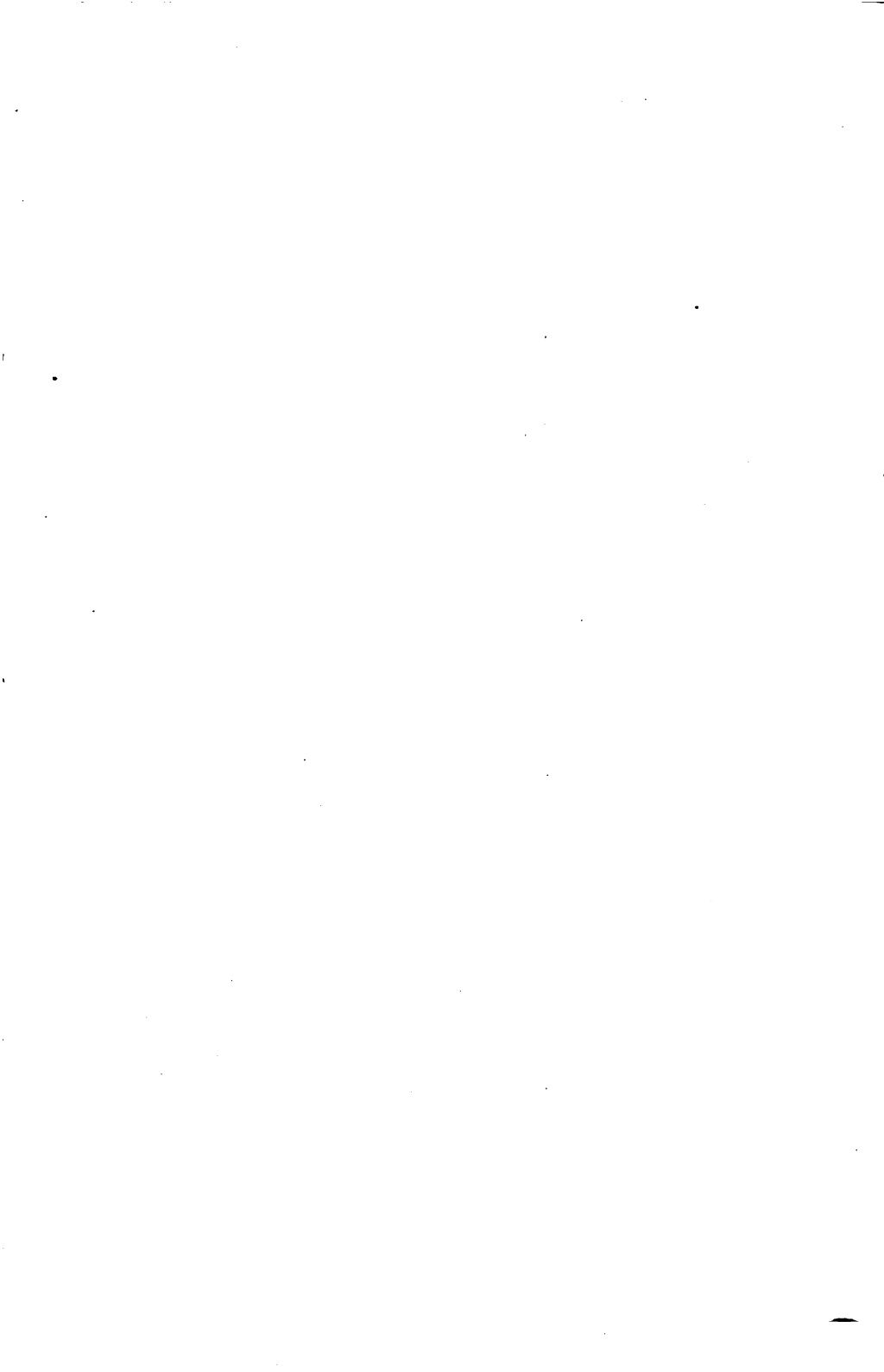


PLATE XV.

"HYMENIACIDON TENEBROSUS, *Bowerbank*.

Fig. 1.—The type-specimen from Birterbuy Bay. Natural size.

Fig. 2.—The specimen of the species collected by the late Dr. Scouler.

Fig. 3.—One of the ovo-spinulate spicula of the skeleton exhibiting its form and proportions, and of those also of the dermal membrane. $\times 264$ linear.

Fig. 4.—The basal end of a fully developed skeleton spiculum. $\times 425$ linear.

Fig. 5.—The basal portion of a slender specimen of a spiculum from the dermal membrane. $\times 425$ linear."

"ISODICTYA FUNALIS, *Bowerbank*.

The specimens of this species having been mislaid by my friend (Rev. A. M. Norman) I have been unable to give a figure of the sponge, but this is of little moment, as the whole of the available specific characters are structural and microscopical.

Fig. 6.—Represents a portion of the dermal membrane exhibiting its subfasciculated character and its numerous bi- and tridentate, equi-anchorate, retentive spicula *in situ*. $\times 94$ linear.

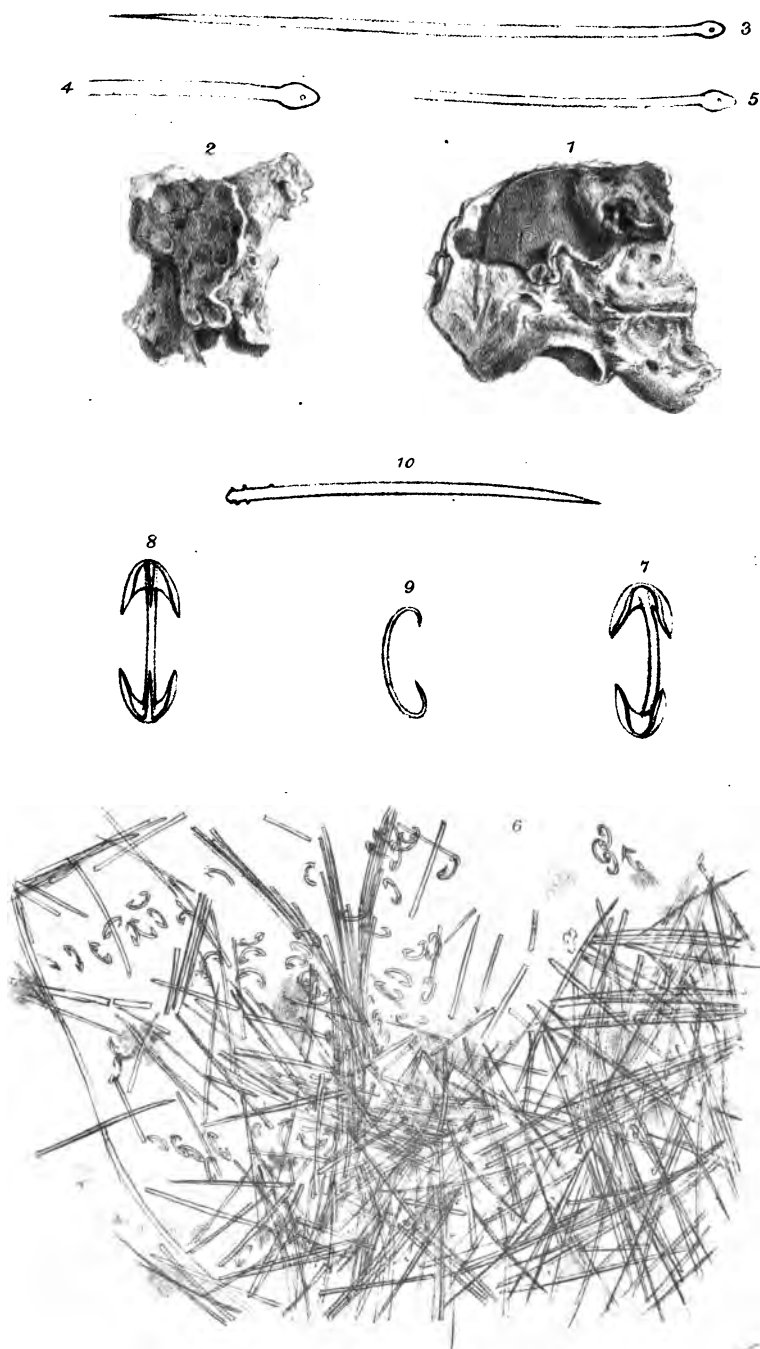
Fig. 7.—One of the palmated, bidentate, equi-anchorate, retentive spicula. $\times 666$ linear.

Fig. 8.—A tridentate, palmated, equi-anchorate, retentive spiculum. $\times 666$ linear.

Fig. 9.—One of the minute and slender bihamate, retentive spicula. $\times 666$ linear.

Fig. 10.—A skeleton spiculum basally incipiently spinous. $\times 308$."

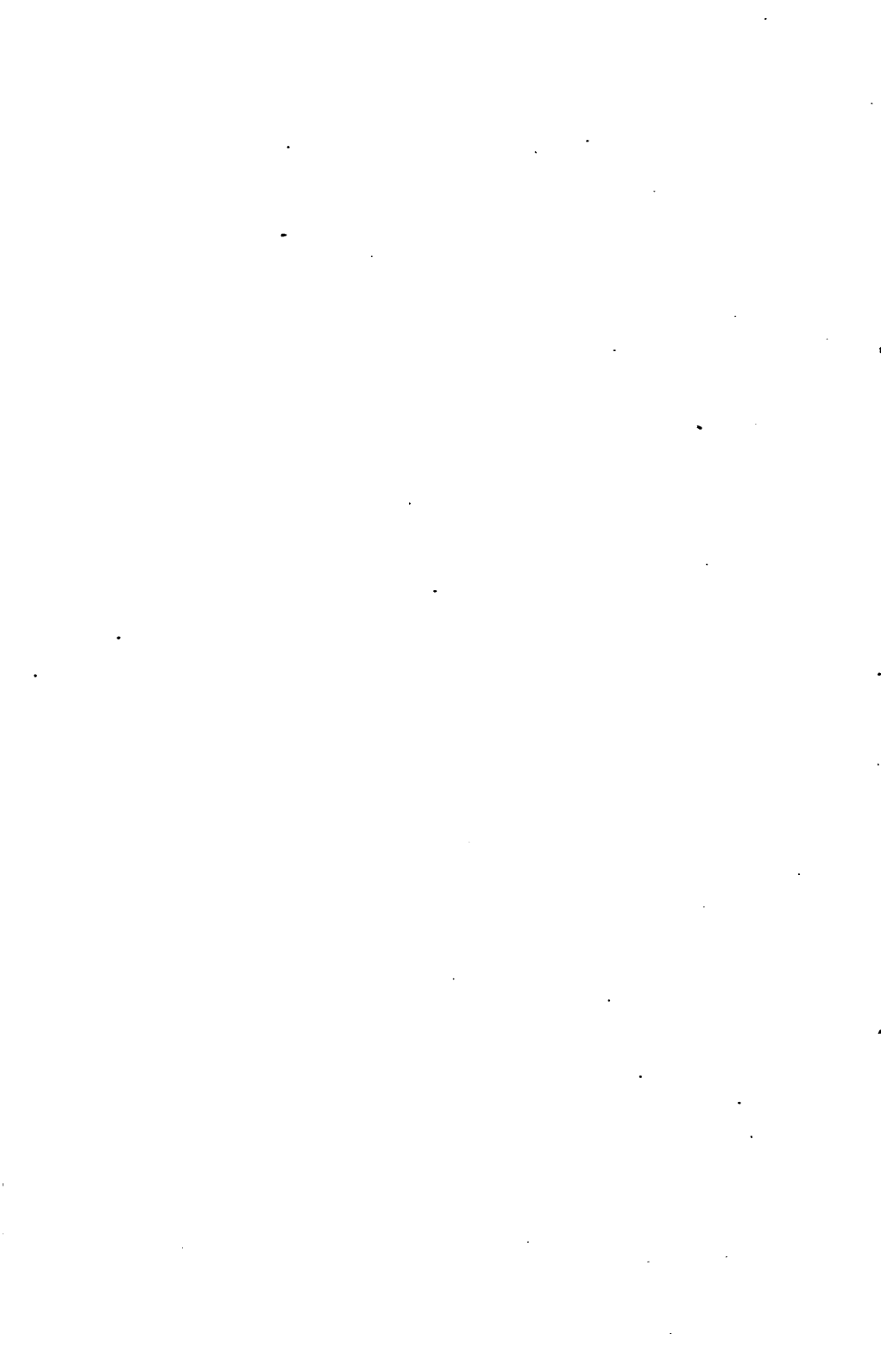
Plate XV.



Hymeniacidon tenebrosus. 1-5. *Isodictya funalis*. 6-10.

J. P. Pinkel del. ex lith.

West Newman & Co.



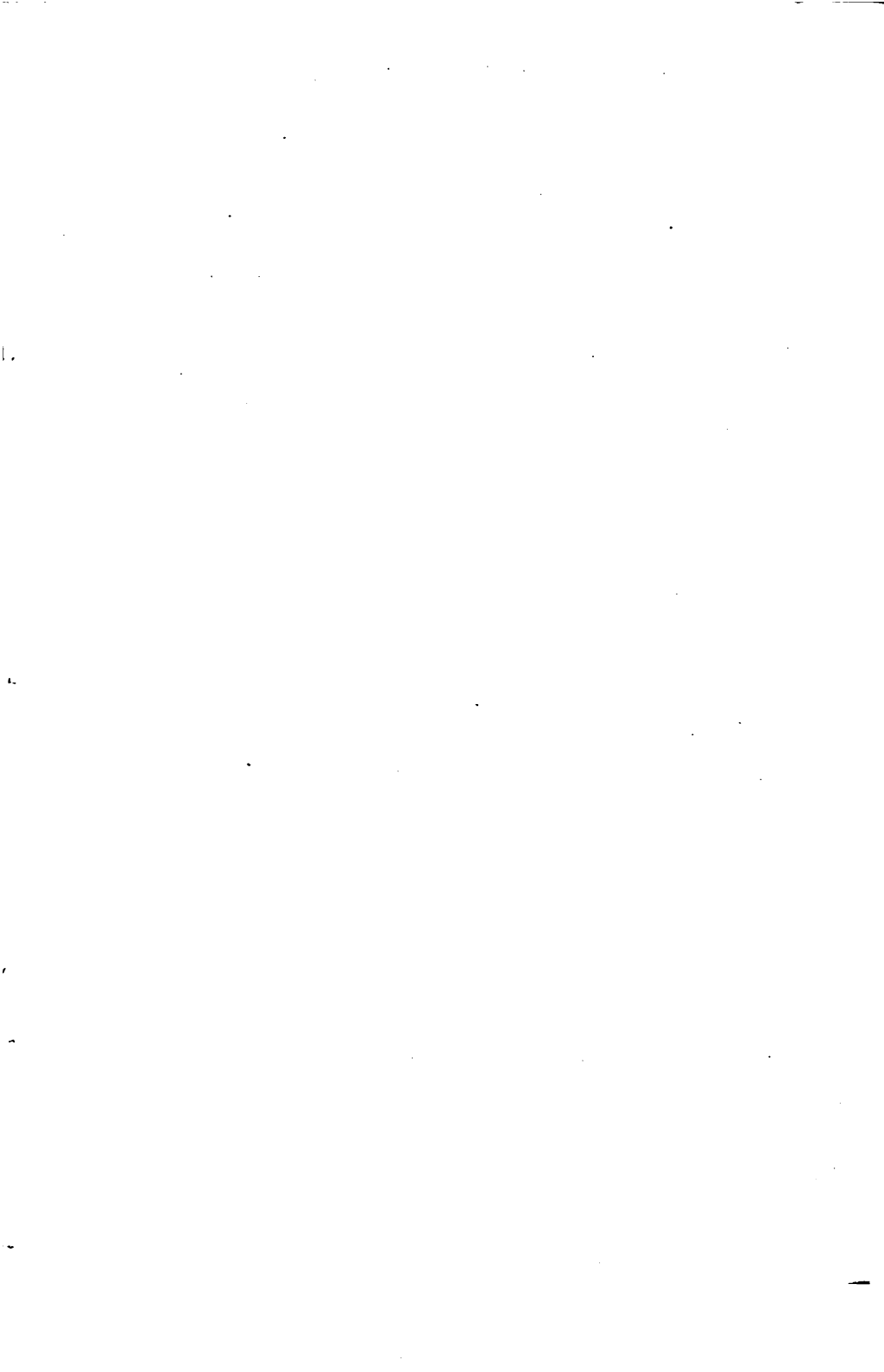


PLATE XVI.

" ISODICTYA INEQUALIS, *Bowerbank*.

Fig. 1.—Represents the type-specimen. Natural size.

Fig. 2.—One of the subfusiformi-acerate tension spicula. $\times 400$ linear.

Fig. 3.—One of the short attenuato-acerate tension spicula. $\times 400$ linear.

Fig. 4.—A bidentate, equi-anchorate, retentive spiculum. $\times 666$ linear.

Fig. 5.—One of the bihamate retentive spicula. $\times 666$ linear.

Fig. 6.—A subfusiformi-acuate basally and apically spinous skeleton spiculum. $\times 400$ linear."

" ISODICTYA IMPLICITA, *Bowerbank*.

Fig. 7.—Represents the type-specimen immersed amid the branches of *Nullipora polymorpha*. Natural size.

Figs. 8. and 9.—Two of the smaller specimens of the species. Natural size.

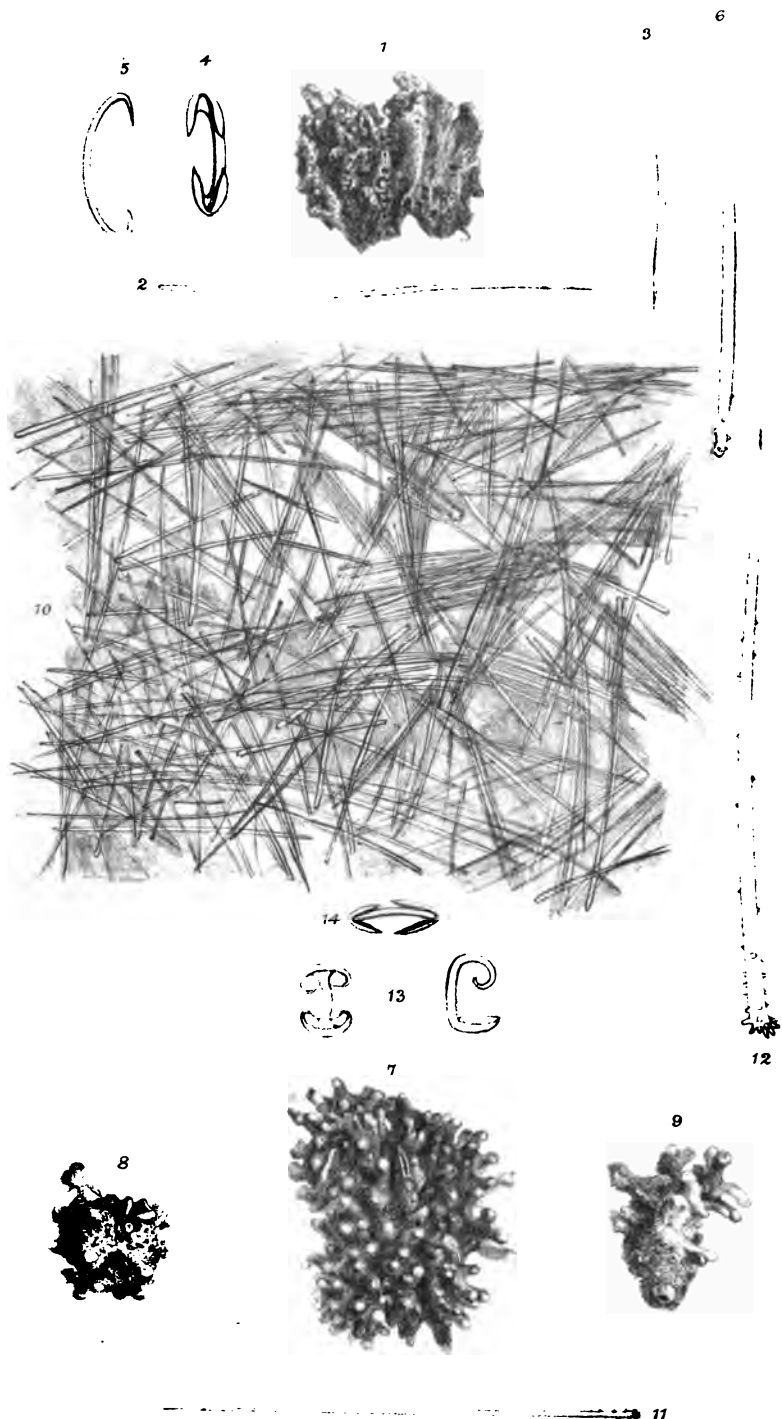
Fig. 10.—A small portion of the subfasciculate dermal membrane exhibiting the irregular mode of the disposition of the tension spicula. $\times 308$ linear.

Fig. 11.—One of the slender attenuato-acuate tension spicula, basally incipiently spinous, of the dermal membrane. $\times 400$ linear.

Fig. 12.—One of the stout attenuato-acuate basally spinous spicula of the dermal membrane. $\times 400$ linear. This figure also represents the skeleton spicula.

Fig. 13.—Represents two of the bipocillate anchorate retentive spicula of the dermal membrane. $\times 1166$ linear.

Fig. 14.—One of the minute inequi-anchorate retentive spicula. $\times 1166$ linear."



Isodictya inaequalis 1-6. *I. implicita* 7-14.



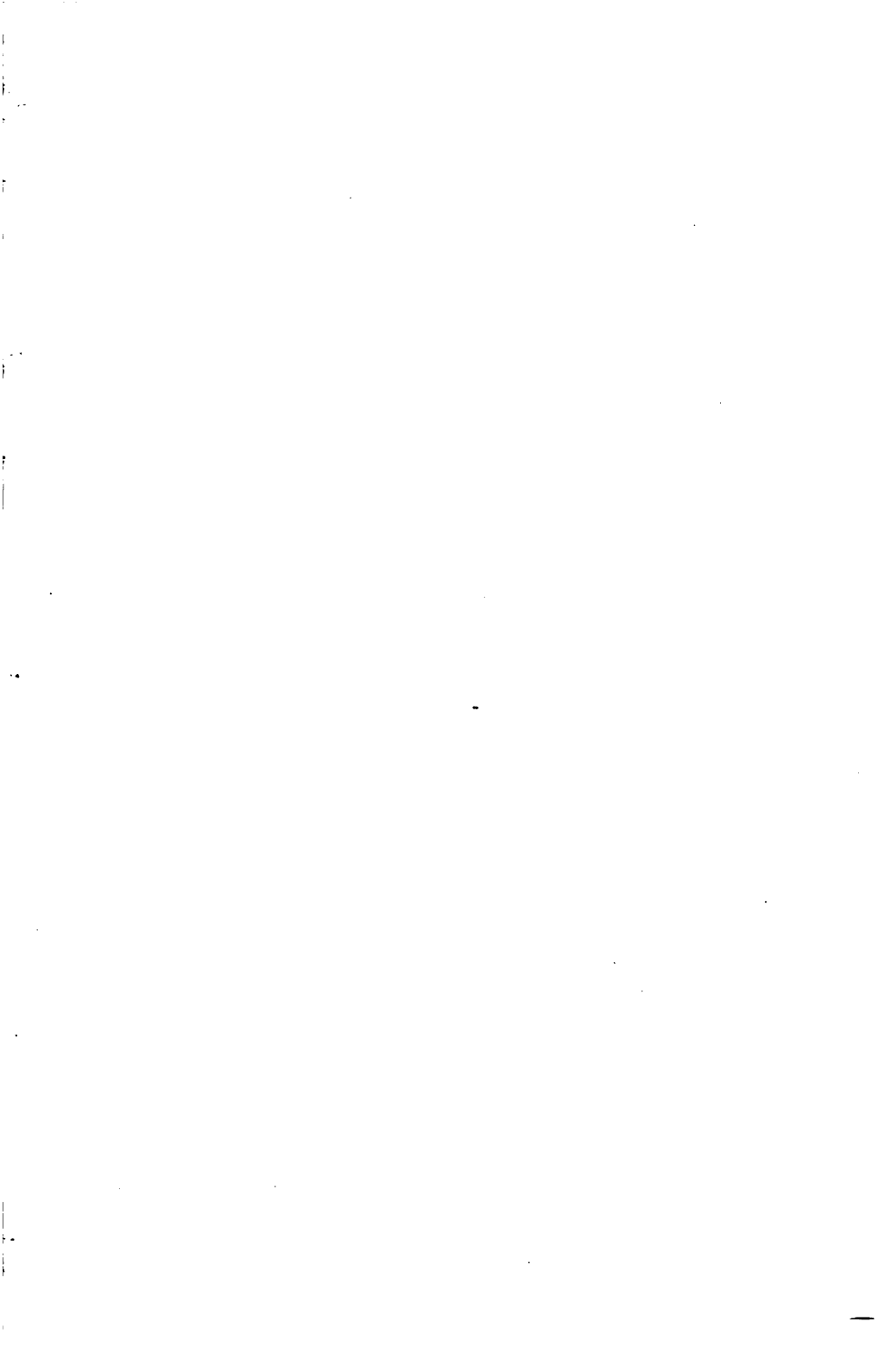


PLATE XVII.

"*RAPHIODESMA INTERMEDIUM*, *Bowerbank*."

Figs. 1 and 2.—Represent the type-specimens of the species. Natural size.

Fig. 3.—A small portion of the dermal membrane exhibiting the structure of the dermal rete and the mode of the disposition of the bihamate retentive spicula. $\times 160$ linear.

Fig. 4.—An average-sized skeleton spiculum. $\times 264$ linear.

Fig. 5.—One of the long and slender tension spicula of the interstitial membranes. $\times 264$ linear.

Fig. 6.—A contort, bihamate, retentive spiculum from the dermal membrane. $\times 264$ linear."

"*RAPHIODESMA FALLACIOSUM*, *Bowerbank*."

Fig. 7.—Represents the shell of *Pecten varius* with the type-specimen of the sponge upon it opposite *a*. Natural size.

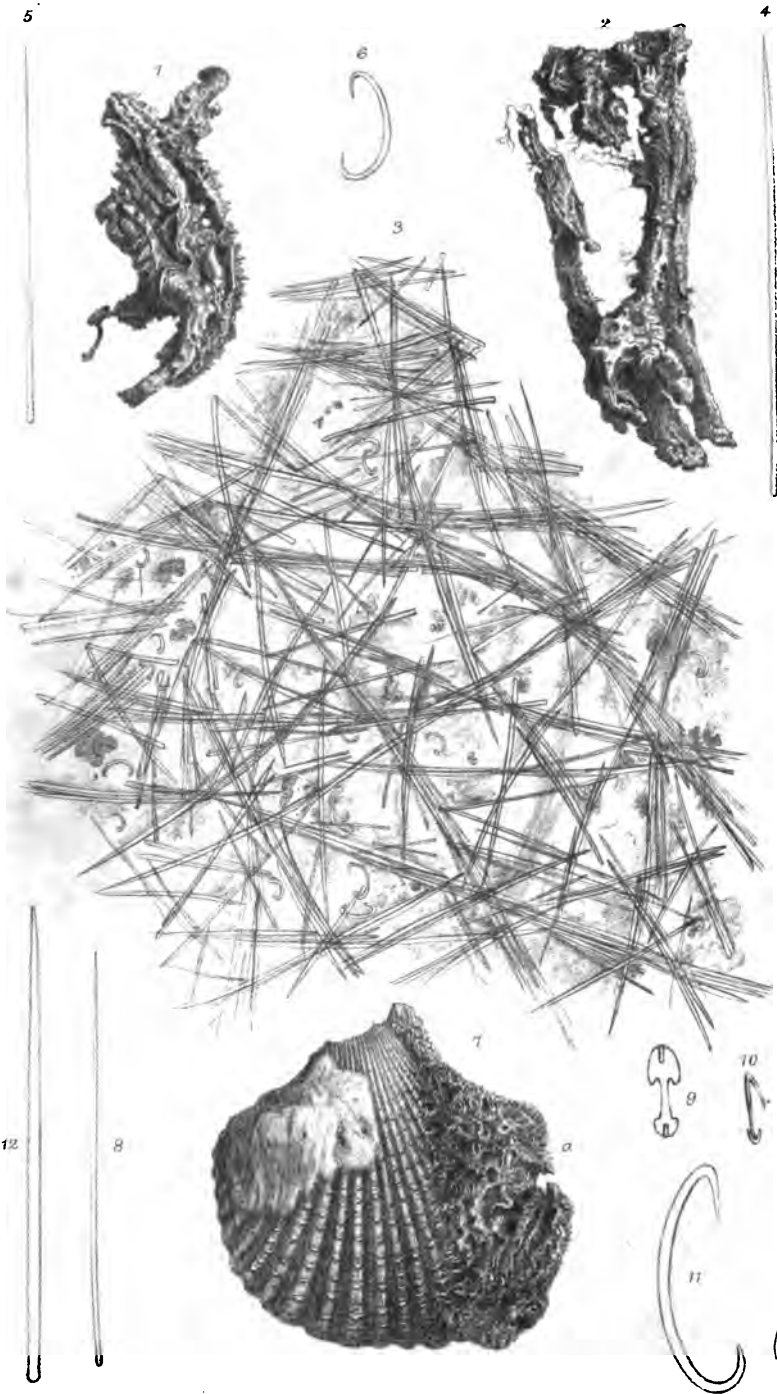
Fig. 8.—One of the long and slender acuate spicula of the dermal fasciculi. $\times 264$ linear.

Fig. 9.—A dentato-palmate inequi-anchorate retentive spiculum from one of the rosette-shaped groups of those spicula from the dermal membrane. None of the rosette-shaped groups were in a sufficiently perfect condition to render it desirable to figure them. $\times 425$ linear.

Fig. 10.—One of the dispersed bidentate, inequi-anchorate, retentive spicula from the dermal membrane. $\times 425$ linear.

Fig. 11.—A contort, bihamate, retentive spiculum from the dermal membrane. $\times 425$ linear.

Fig. 12.—One of the subfusiform acuate skeleton spicula. $\times 264$ linear."



Raphiodesma intermedius. 1-6. *R. fallaciosum*. 7-12